

ALASKA PENINSULA SALMON CATCH AND ESCAPEMENT
SAMPLING PROCEDURES

1996 OPERATIONAL PLANS

By

Robert L. Murphy

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Alaska Department of Fish and Game
Commercial Fisheries management and Development Division
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TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	i
LIST OF FIGURES	i
LIST OF APPENDICES	ii
INTRODUCTION	1
OBJECTIVES	1
SUPERVISION	2
PERSONNEL	2
Dates of Sampling Events	2
METHODS	2
King Cove June Sockeye Sampling	4
DATA ANALYSIS AND REPORTING	4
LITERATURE CITED	6
TABLES	7
FIGURES.....	15
APPENDICES	21

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Districts, sections, and statistical areas for the Alaska Peninsula and Aleutian Islands Management Areas, 1996	7
2. Sockeye salmon catch sampling schedule for the Alaska Peninsula and Aleutian Islands Management Areas, 1996	8
3. Chum salmon catch sampling schedule for the Alaska Peninsula and Aleutian Islands Management Areas, 1996	10
4. Coho salmon catch sampling schedule for the Alaska Peninsula Management Areas, 1996	12
5. Chinook salmon catch sampling schedule for the Alaska Peninsula Management Areas, 1996	14

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. The Alaska Peninsula Management Area	15
2. Aleutian Islands Management Area with districts shown.....	16
3. The Southeastern District with statistical areas shown	17
4. The South Central District with statistical areas shown.....	18
5. The Southwestern District with statistical areas shown	19
6. The Unimak District with statistical areas shown	20

LIST OF APPENDICES

	<u>Page</u>
APPENDIX A: ALASKA PENINSULA SCALE SAMPLING TECHNIQUE	21
APPENDIX B: COMPLETION OF MARK-SENSE AWL FORMS	23
B.1. Assigned port and weir location codes	30
B.2. Chinook salmon AWL form and gumcard with three scales per fish.....	31
B.3. Periods and corresponding calendar dates, 1996.....	32
B.4. Sockeye salmon AWL form and gumcard with one scale per fish.....	33
B.5. Coho salmon AWL form and gumcard with four scales per fish.....	34
APPENDIX C: CAMP POLICY	35
APPENDIX D: FIRST AID AND SAFETY	39

INTRODUCTION

The Alaska Peninsula and Aleutian Islands Management Areas commercial fishing area encompasses the Aleutian Islands, the North Alaska Peninsula west of Cape Menshikof, and the South Alaska Peninsula west of Kupreanof Point (Figures 1-6). There are 335 known salmon producing streams in the Aleutian Islands Area and 247 salmon producing streams in the Alaska Peninsula Area (Murphy 1992).

Five species of salmon are commercially harvested in the Alaska Peninsula and Aleutian Islands Management Areas: chinook, sockeye, pink, chum, and coho. Economically, sockeye and pink salmon are usually the primary species in the South Alaska Peninsula while sockeye and chum salmon are usually the primary species in the North Alaska Peninsula and pink salmon have been of economic importance in the Aleutian Islands. In some North Peninsula fisheries, chinook and coho salmon may be more economically important than chum salmon.

In 1985, an expanded chinook, sockeye, chum, and coho salmon commercial catch sampling operation was initiated in the Alaska Peninsula Management Area for establishing a data base for separating stocks, evaluating escapement goals, forecasting, and assessing inseason run timing. The current emphasis is on sockeye and chum salmon, with chinook and coho salmon also sampled.

OBJECTIVES

The sampling program objective is to determine sockeye and chum salmon age composition from the catch in the Alaska Peninsula fisheries with a level of precision for the major systems. Chinook and coho salmon are also sampled to obtain baseline age composition data.

Long Term: Improve management of salmon resources for the Alaska Peninsula and Aleutian Islands Management Areas through improvement of projecting runs, development of stock-recruitment relationships to assess escapement requirements, and accurate assessment of stock contribution levels for mixed stock fisheries.

Short Term: Develop brood tables for major sockeye and chum stocks, and determine age composition for each species of major stocks.

1. Determine salmon catch and effort by species and statistical area (Table 1).
2. Determine the age composition of chinook, sockeye, chum, and coho salmon for all major stocks.
3. Establish an archive of scales suitable for potential analysis in interception and mixed stock fisheries.

SUPERVISION

Bob Murphy, Area Management Biologist (AMB), will supervise the catch sampling crews at Port Moller and King Cove.

PERSONNEL

Two person crews will be stationed to sample the commercial salmon catch for the Alaska Peninsula Management Area at Port Moller and King Cove. The King Cove crew will be responsible for pressing all scales that are collected in King Cove, and the Port Moller crew will be responsible for pressing all scales collected in any other location, unless otherwise instructed differently. Trained staff will read all scales collected in-season.

Dates of Sampling Events

The Port Moller sampling crew is expected to begin collection of age composition data about 1 June to approximately 5 September. The Port Moller crew will be responsible for catch sampling the commercial fisheries on the North Peninsula and possibly the South Peninsula commercial catch, if fish are delivered to Port Moller instead of King Cove.

The King Cove sampling crew is expected to begin collecting age composition data on the first June South Peninsula opening around 10 June and complete sampling on 18 August. The King Cove crew will be responsible for catch sampling the commercial fisheries on the South Peninsula, primarily the South Unimak, Shumagin Islands, Southeastern District Mainland area, and Uria Bay areas. With the closure of the majority of South Peninsula during 1-19 July, the King Cove crew will move to field projects outside of King Cove and report to duty in King Cove around 19 July.

METHODS

To ensure that samples from the designated areas are representative, mixed loads from multiple areas will not be sampled nor will there be any pre-selection of fish for length, sex, or condition. The tender schedules and locations will allow the sampling of pure loads obtained from the separate areas. To ensure that samples are not missed the crews will begin sampling the first day the respective catches are delivered from the designated sampling areas for each week (Sunday to Saturday). Sampling usually will begin on Monday for catches from the previous day and end on Saturday. If the sampling crew believes that there is a high probability of collecting samples from the same area on more than one occasion during a week, the crew should try to collect the sample over the entire week. If the sampling crew is unsure, another sample can be collected later in the week, the crew should collect all the samples when they are first available. Additional sampling may occur at Canoe and Uria Bays. It is

important to determine where the tenders have loaded fish. On the South Peninsula, the tenders deliver in both Sand Point and King Cove, with the majority delivering in King Cove.

Specific procedures for collecting and recording salmon age (scales) are in Appendix A and B. The accuracy of the data is the responsibility of the crew leaders. All questions concerning collection procedures should be brought to the attention of the supervisor at the first available opportunity.

Sample sizes are statistically derived to ensure the accuracy and precision of age composition work or stock composition methodologies. Catch sampling crews will be collecting 300 samples/period/area for chinook and coho salmon, 600 samples/period/area for sockeye, and 440 samples/period/area for chum salmon (Tables 2-5).

These sample sizes are the maximum. The maximum sample sizes may not always be available, especially for small local runs and early and late in the season. Do not sample an area unless at least 75 fish can be sampled for a given species during a period. The exceptions to this rule would be for a run where knowledge is limited, such as the sockeye run at Thin Point. Some areas may never have a pure load (i.e. Swanson Lagoon). At these areas, try to sample the fish when deliveries are 90% or more from one area (mark the percent of each fishing area on the top of each AWL form). Areas that will never be greater than 90% pure (i.e. Catherine's Cove), sample as time permits. Future analysis of the data will take the mixture into consideration.

Since scale samples from catch and escapement sampling will be aged in Port Moller, periodic samples collected in King Cove, or elsewhere, will be sent pressed and with the appropriate paperwork to Port Moller. To ensure safe delivery notify the crew leader: 1) that the data is being mailed (use a secure moisture proof container); 2) what data is being sent; 3) when delivery is expected in Port Moller; and 4) who is transporting the data. The crew leader at King Cove will maintain a log book of all outgoing catch samples.

Sockeye and chum sampling are the top priorities during all periods from the specified fishing areas. Chinook and coho salmon will be sampled as time allows. During the fall, coho salmon will be sampled when possible.

All crews will sample the first day of each period as the salmon become available. For each AWL sample, scales from the preferred area will be taken and as defined in Appendix A and B.

Weight sampling of salmon will occur in fisheries when requested by the Area Management Biologists. Samples will be randomly selected so that they are representative of the harvest.

No length sampling will be conducted unless otherwise requested by ADF&G personnel.

All crews should report all fin clipped and tagged fish to the appropriate supervisor. For chinook salmon with a clipped adipose fin, the head should be sealed in plastic, frozen, and sent to Andy McGregor, ADF&G, Juneau, Alaska, 99824. Catch location, catch date, gear type, species, tag number, type of tag, length, weight, and several scales from the preferred area should be included with the catch report.

The King Cove crew should anticipate supply shortages in-season and to notify staff in Port Moller before the supplies are exhausted. Each crew leader will keep a daily log book of activities. A report from each crew leader outlining problems encountered and solutions, as well as any suggestions for the project should be sent to Port Moller at the end of the season along with an equipment list and place of storage.

Appendix C contains general equipment, cabin maintenance, and crew policy.

Appendix D contains information on first aid and safety.

The responsibility of proper identification of catch area will be a necessary component of the dockside catch sampling crew.

King Cove June Sockeye Sampling

The King Cove crew will send all sockeye scale samples collected from the June South Peninsula commercial fisheries to ADF&G in King Salmon for pressing and aging, along with the appropriate AWL forms. The scales will be sent within one day of collection to the address below. An account has been setup with Reeve Aleutian Airways (RAA) and Peninsula Airways from King Cove to Cold Bay, and RAA from Cold Bay to Anchorage, and Peninsula Air from Anchorage to King Salmon to expedite the shipping process. All invoices should be sent to ADF&G in King Salmon. A log book should be kept of the date sent and invoice number, sample location (i.e. Cape Lutke), and how many scale samples from each area were sent. ADF&G in King Salmon will be notified when a package is sent by phoning Bev Cross @ 246-3341. The sockeye scales will be used by ADF&G in King Salmon as an inseason indicator of returning run composition.

Address scale packets to:

Alaska Department of Fish & Game
CFMD Division
P.O. Box 37
King Salmon, AK 99613
Attn: Bev Cross ph: 907-246-3341

DATA ANALYSIS AND REPORTING

A Regional Information Report will be completed for the 1996 season by 1 May 1997.

ADF&G has used scale pattern analysis to separate sockeye stocks in mixed stock fisheries. North Peninsula sockeye fisheries from Harbor Point to Strogonof Point and escapement samples of sockeye

scales and completed AWL forms will be returned to Kodiak for possible future scale pattern analysis studies. Presently, funding is not available for scale pattern analysis studies on the Alaska Peninsula.

LITERATURE CITED

- Murphy, R.L. 1992. Number of salmon systems and distribution of escapements in the Alaska Peninsula and Aleutian Islands Management Areas, 1986-91. Regional Information Report No. 4K92-15, Alaska Department of Fish and Game, Division of Commercial Fisheries, Region IV Report, Kodiak.

Table 1. Districts, sections, and statistical areas for the Alaska Peninsula and Aleutian Islands Management Areas, 1996.

Fishing Area Location	Statistical Areas
SOUTH PENINSULA	
Southeastern District	
Southeastern District Mainland	281-15; 281-25; 281-30; 281-40; 281-50; 281-60; 281-70; 281-80; 281-90
Shumagin Islands Section	282-10; 282-11; 282-20; 282-25; 282-30; 282-35; 282-40; 282-42; 282-45; 282-65; 282-70; 282-75; 282-80
South Central District	
Canoe Bay	283-24
Pavlof Bay	283-21; 283-23; 283-25; 282-26
Southwestern District	
Volcano Bay	284-36
Belkofski Bay	284-42
King Cove	284-45
Cold Bay	284-62; 284-65; 284-67
Deer Island	284-55
Thin Point	284-75
Morzhovoi Bay	284-80
Ikatan Peninsula to Cape Lazaref	284-90; 285-20; 285-30
Sanak Island	285-10
Unimak District	
Cape Lutke	285-40
ALEUTIAN ISLANDS AREA	
Unalaska District	302-22
NORTH PENINSULA	
Northwestern District	
Urilia Bay	311-32
Swanson Lagoon	311-52
Bechevin Bay	311-60
Izembek-Moffet Bay Section	312-10; 312-20; 312-40
Northern District	
Black Hills Section	313-10
Nelson Lagoon Section	313-30
Herendeen Bay	314-20
Harbor Point to Cape Seniavin	314-12; 315-11; 315-20
Cape Seniavin to Strogonof Point	316-10; 316-20; 316-22; 316-25
Harbor Point to Strogonof Point	314-12; 315's,; 316's
Outer Port Heiden Section	317-10
Inner Port Heiden Section	317-20
Cinder River Section	318-20

Table 2. Sockeye salmon catch sampling schedule for the Alaska Peninsula and Aleutian Islands Management Areas, 1996.

Crew	SAMPLING AREA			SAMPLE			
	District/Section	Geographic Area	Statistical Area(s)	Freq.	Size	Data	Fishery
Port Moller	Northern District:						
	Nelson Lagoon Section	Nelson Lagoon	313-30	Weekly	600	Scales	Terminal
	Bear River (prior to June 25)	Harbor Point to Cape Seniavin	314-12, 315-11, 20	Weekly	600	Scales	Mixed
	Bear River, Three Hills, and Ilnik Sections (post June 24)	Harbor Point to Strogonof Point	314-12, 315-11, 20 316-10, 20, 22, 25	Weekly	1,200	Scales	Mixed
	Ilnik Section (Lagoon)	Ilnik Lagoon	316-22	Weekly	600	Scales	Terminal
	Outer Port Heiden Section	Outer Port Heiden	317-10	Weekly	600	Scales	Mixed
	Inner Port Heiden Section	Inner Port Heiden	317-20	Weekly	600	Scales	Terminal
King Cove	Northwestern District:						
		Urilia Bay	311-32	Weekly	600	Scales	Terminal
	Southeastern District:						
	Southeastern District Mainland	Beaver and Balboa Bays, Stepovak	281-90, 80, 30	Weekly	600	Scales	Mixed
	Shumagin Is. Section	Shumagin Islands	282's, see Table 1	Weekly	600	Scales	Mixed
	South Central District:						
		Long Beach	283-26	Weekly	600	Scales	Mixed
		Cape Tolstoi	283-21	Weekly	600	Scales	Mixed
		Canoe Bay	283-24	Weekly	600	Scales	Mixed
		Pavlof Bay	283-21, 23, 25, 26	Weekly	600	Scales	Mixed
	Southwestern District:						
	Thin Point Section	Thin Point Lagoon	284-75	Weekly	600	Scales	Terminal
		Morzhovoi Bay	284-80	Weekly	600	Scales	Terminal

-Continued-

Table 2. (page 2 of 2)

Crew	District/Section	SAMPLING AREA		Freq.	SAMPLE		
		Geographic Area	Statistical Area(s)		Size	Data	Fishery
King Cove	Unimak District:	Cape Lutke	285-40	Weekly	600	Scales	Mixed
		Ikatan Peninsula to C. Lazaref	284-90, 285-20, 30	Weekly	600	Scales	Mixed
	Unalaska District	Aleutian Islands Management Area	302-	Weekly	600	Scales	Mixed

Table 3. Chum salmon catch sampling schedule for the Alaska Peninsula and Aleutian Islands Management Areas, 1996.

Crew	District/Section	SAMPLING AREA		Freq.	SAMPLE		
		Geographic Area	Statistical Area(s)		Size	Data	Fishery
Port Moller	Northern District:						
	Nelson Lagoon Section	Nelson Lagoon	313-30	Weekly	440	Scales	Terminal
	Moller/Herendeen Bay Section	Herendeen Bay	314-20	Weekly	440	Scales	Terminal
	Bear River Section (prior to June 25)	Harbor Point to Cape Seniavin	314-12, 315-11, 20	Weekly	440	Scales	Mixed
	Bear River, Three Hills, and Ilnik Sections (post June 24)	Harbor Point to Strogonof Point	314-12, 315-11, 20 316-10, 20, 22, 25	Weekly	440	Scales	Mixed
King Cove	Northwestern District:						
	Izembek-Moffet Bay Section	Izembek-Moffet Bay	312-10, 20, 40	Weekly	440	Scales	Terminal
		Swanson Lagoon	311-52	Weekly	440	Scales	Mixed
	Southeastern District:						
	Southeastern District Mainland	Beaver and Balboa Bays, Stepovak	281-90, 80, 70	Weekly	440	Scales	Mixed
	Shumagin Is. Section	Shumagin Islands	282-10, 11, 20, 25, 30, 35, 40, 42	Weekly	440	Scales	Mixed
	South Central District:						
		Coal Bay	283-17	Weekly	440	Scales	Mixed
		Canoe Bay	283-24	Weekly	440	Scales	Mixed
		Pavlof Bay	283-21, 23, 25, 26	Weekly	440	Scales	Mixed
	Southwestern District:						
		Volcano Bay	284-36	Weekly	440	Scales	Mixed
		Belkofski Bay	284-42	Weekly	440	Scales	Terminal
		Cold Bay	284-62, 65, 67	Weekly	440	Scales	Mixed
		Morzhovoi Bay	284-80	Weekly	440	Scales	Both

-Continued-

Table 3. (page 2 of 2)

Crew	District/Section	SAMPLING AREA		Freq.	SAMPLE		
		Geographic Area	Statistical Area(s)		Size	Data	Fishery
King Cove	Unimak District:	Cape Lutke	285-40	Weekly	440	Scales	Mixed
		Ikatan Peninsula to C. Lazaref	284-90, 285-20, 30	Weekly	440	Scales	Mixed

Table 4. Coho salmon catch sampling schedule for the Alaska Peninsula Management Areas, 1996.

Crew	SAMPLING AREA		Statistical Area(s)	Freq.	SAMPLE		
	District/Section	Geographic Area			Size	Data	Fishery
Port Moller	Northern District:						
	Nelson Lagoon Section	Nelson Lagoon	313-30	Weekly	300	Scales	Terminal
	Bear River, Three Hills, and Ilnik Sections	Harbor Point to Strogonof Point	314-12, 315-11, 20 316-10, 20, 22, 25	Weekly	300	Scales	Terminal
King Cove	Northwestern District:						
	Izembek-Moffet Bay Section	Izembek-Moffet Bay	312-10, 20, 40	Weekly	300	Scales	Terminal
		Swanson Lagoon	311-52	Weekly	300	Scales	Terminal
	Southeastern District:						
	Southeastern District Mainland	Beaver and Balboa Bays, Stepovak	281-90, 80, 70	Weekly	300	Scales	Mixed
	Shumagin Is. Section	Shumagin Islands	282-10, 11, 20, 25, 30, 35, 40, 42	Weekly	300	Scales	Mixed
	South Central District:						
		Coal Bay	283-17	Weekly	300	Scales	Mixed
		Canoe Bay	283-24	Weekly	300	Scales	Mixed
		Pavlof Bay	283-21, 23, 25, 26	Weekly	300	Scales	Mixed
	Southwestern District:						
		Volcano Bay	284-36	Weekly	300	Scales	Mixed
		Belkofski Bay	284-42	Weekly	300	Scales	Terminal
		Cold Bay	284-62, 65, 67	Weekly	300	Scales	Mixed
		Morzhovoi Bay	284-80	Weekly	300	Scales	Both

-Continued-

Table 4. (page 2 of 2)

Crew	District/Section	SAMPLING AREA		Freq.	SAMPLE		
		Geographic Area	Statistical Area(s)		Size	Data	Fishery
King Cove	Unimak District:	Cape Lutke	285-40	Weekly	300	Scales	Mixed
		Ikatan Peninsula to C. Lazaref	284-90, 285-20, 30	Weekly	300	Scales	Mixed

Table 5. Chinook salmon catch sampling schedule for the Alaska Peninsula Management Areas, 1996.

Crew	SAMPLING AREA			SAMPLE			
	District/Section	Geographic Area	Statistical Area(s)	Freq.	Size	Data	Fishery
Port Moller	Northern District:						
	Nelson Lagoon Section	Nelson Lagoon	313-30	Weekly	300	Scales	Terminal
	Bear River Section (prior to July 25)	Harbor Point to Cape Seniavin	314-12, 315-11, 20	Weekly	300	Scales	Terminal
	Bear River, Three Hills, Ilnik Section (post June 24)	Harbor Point to Strogonof Point	314-12, 315-11, 20 316-10, 20, 22, 25	Weekly	300	Scales	Terminal

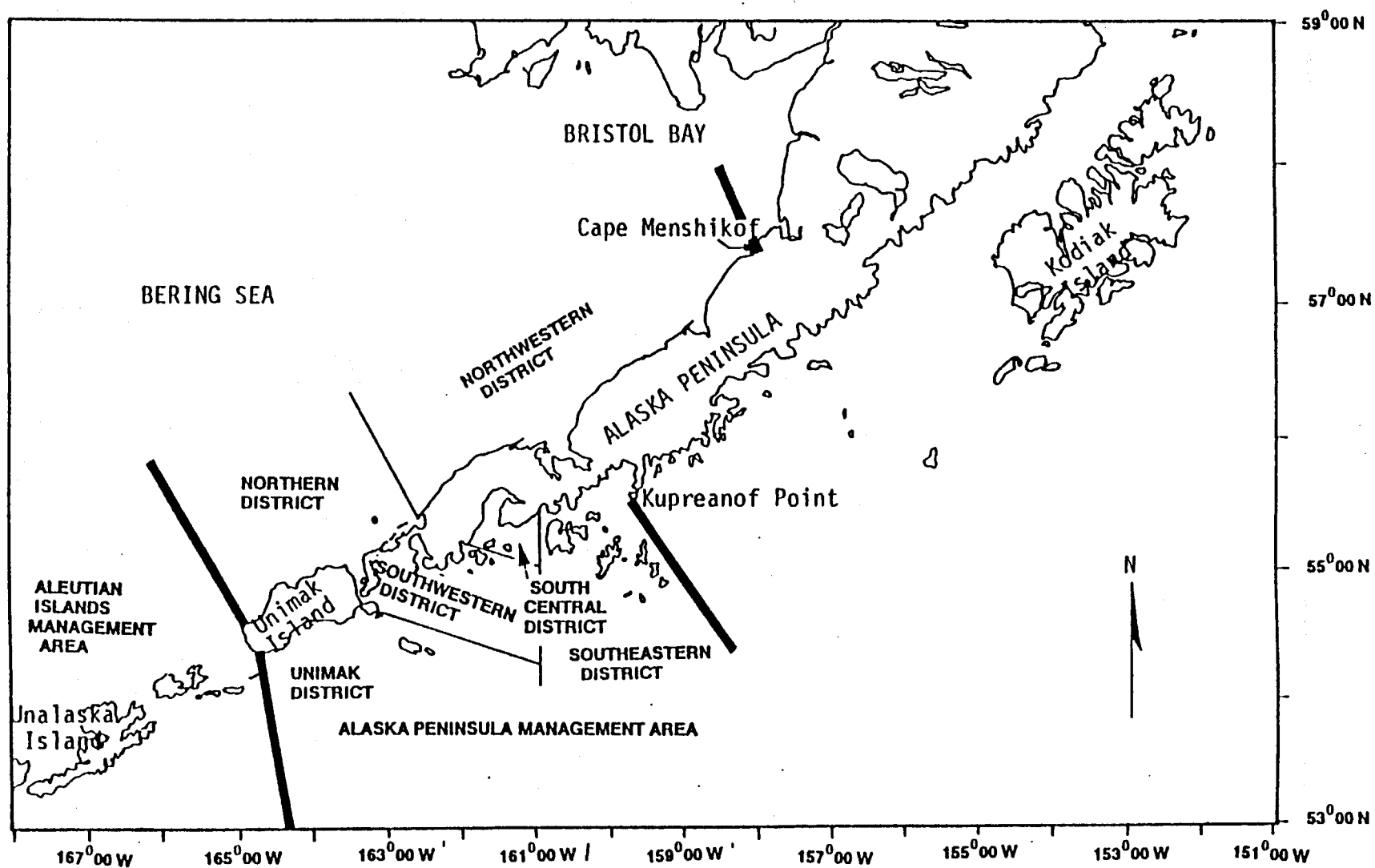


Figure 1. The Alaska Peninsula Management Area.

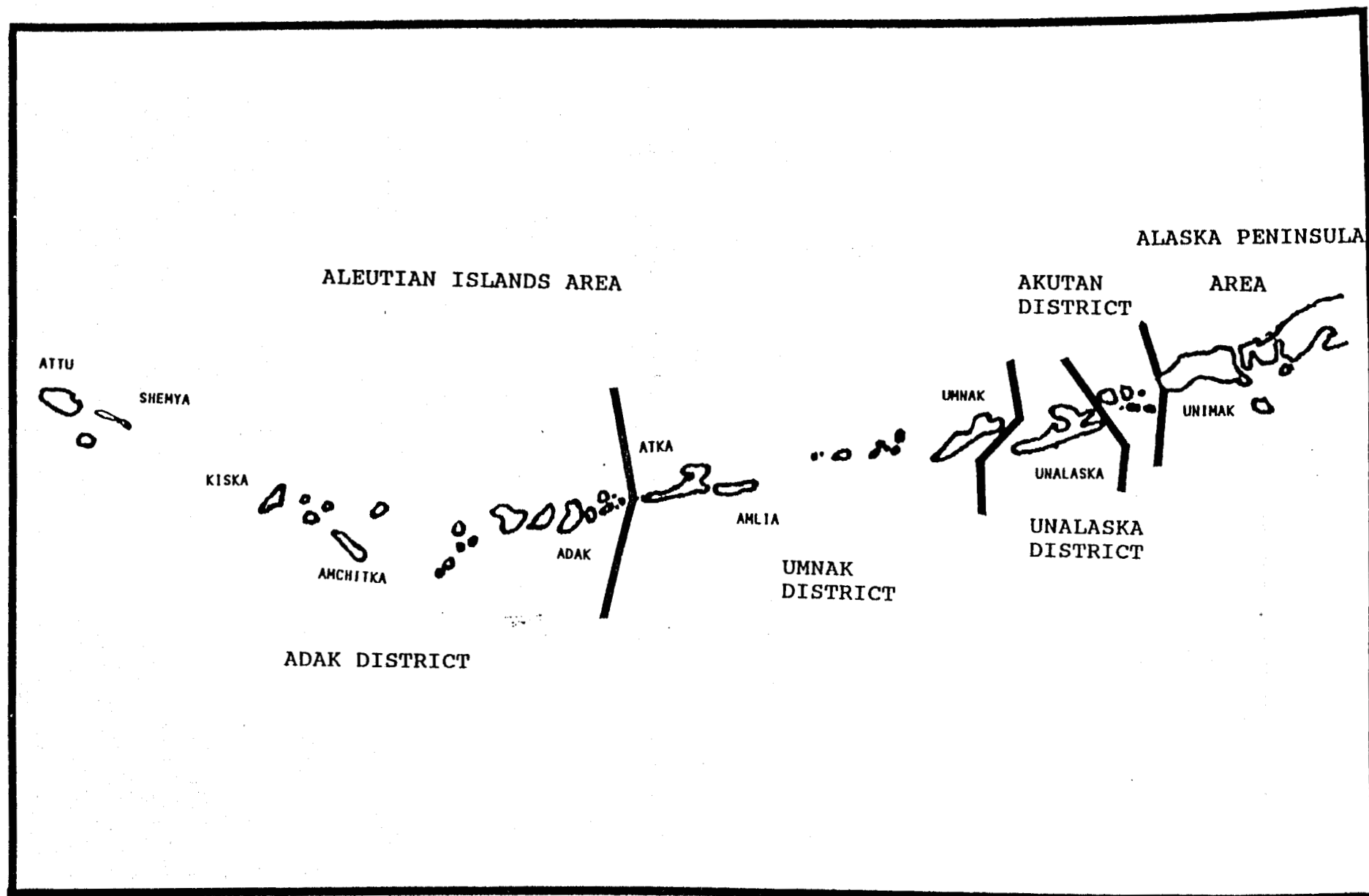


Figure 2. Aleutian Islands Management Area with districts shown.

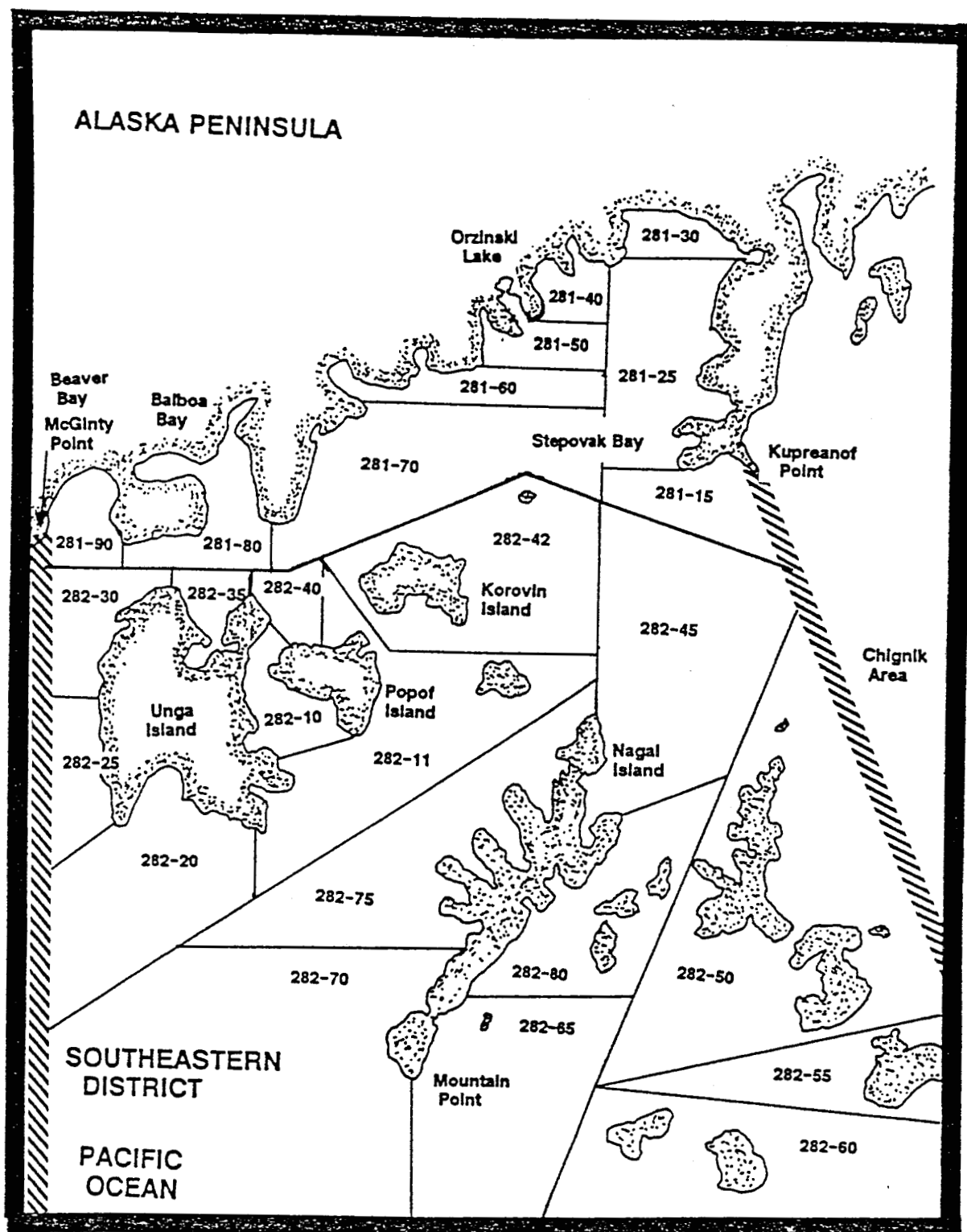


Figure 3. The Southeastern District with statistical areas shown.

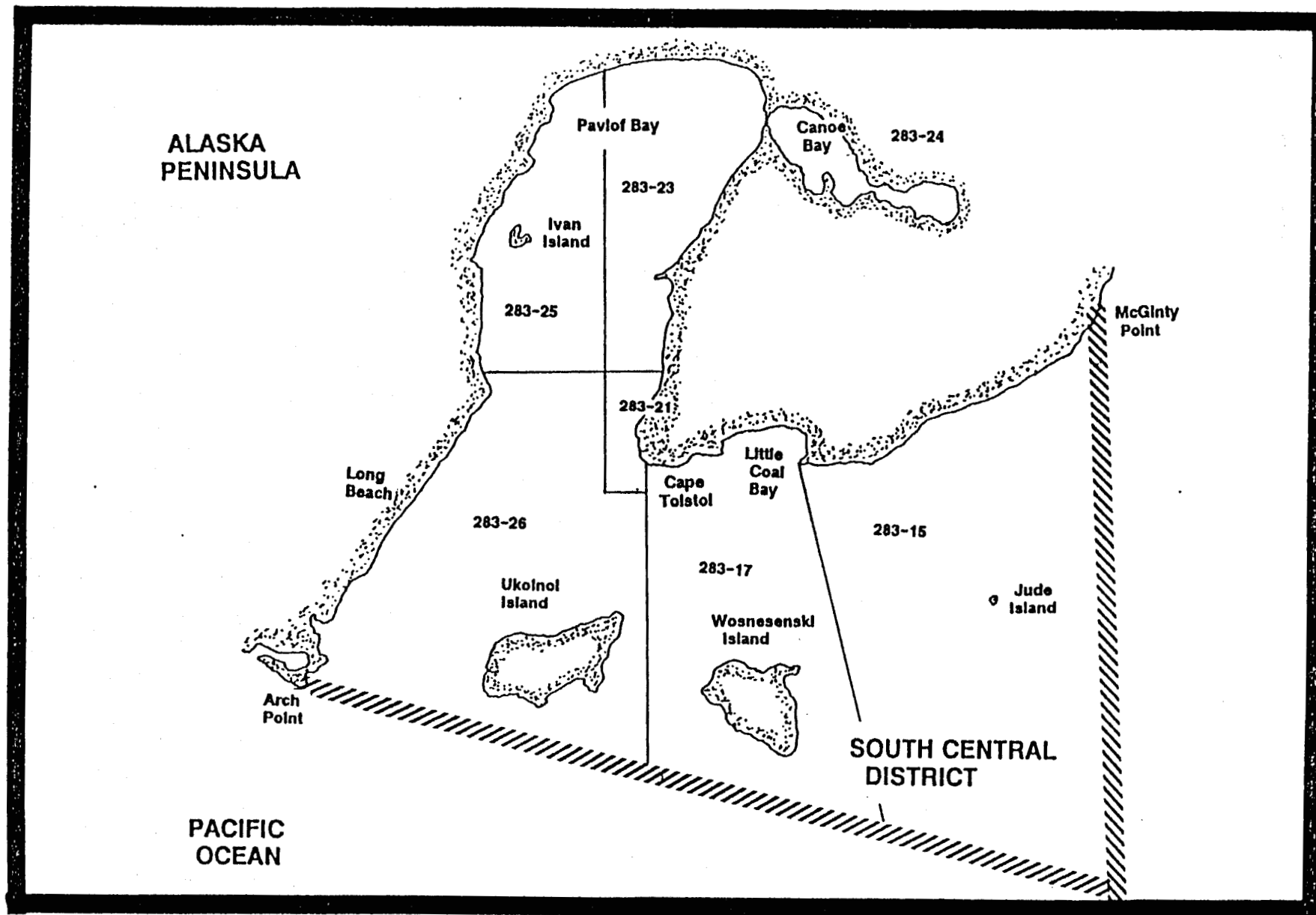


Figure 4. The South Central District with statistical areas shown.

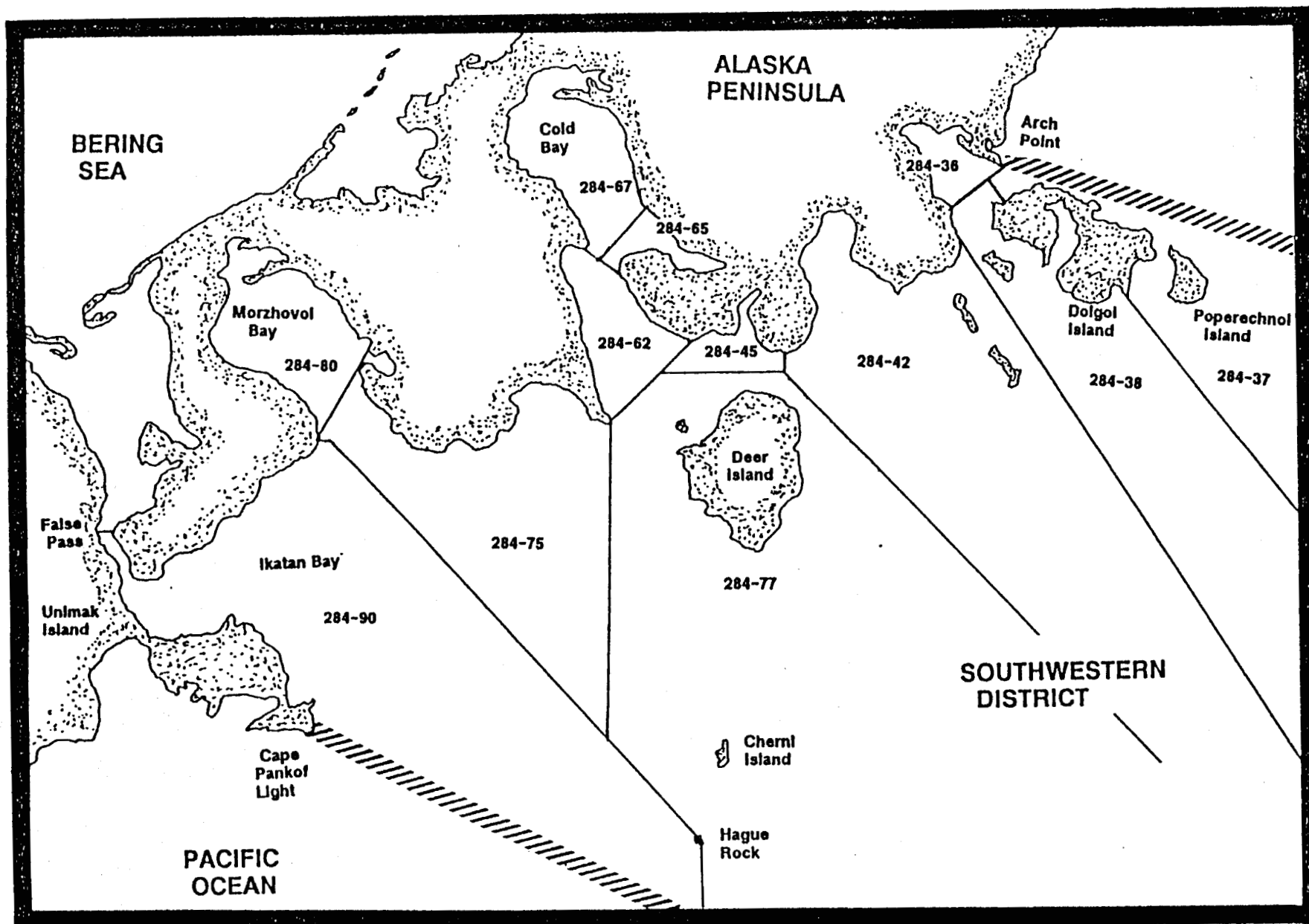


Figure 5. The Southwestern District with statistical areas shown.

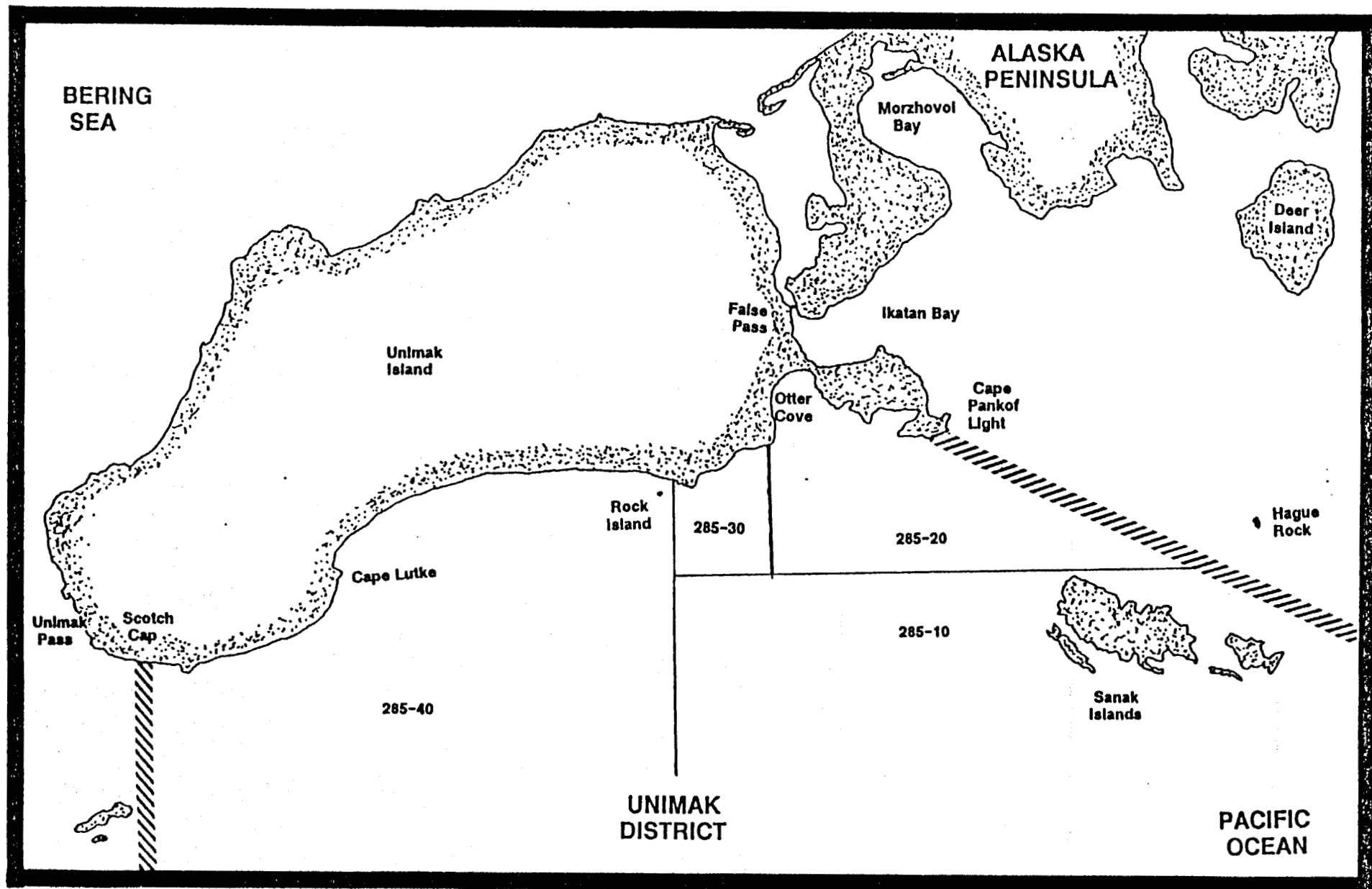


Figure 6. The Unimak District with statistical areas shown.

APPENDIX A

Alaska Peninsula Scale Sampling Technique

ALASKA PENINSULA SCALE SAMPLING TECHNIQUE

If you have not taken scales before or if you have any questions ask somebody who has prior experience with the sampling procedure. Scales must be readable to be useful, so follow proper techniques when sampling.

Gum Cards

A scale card is a gum-backed sheet numbered 1 through 40. Samples are placed on the cards with no attempt to separate the fish by their sex.

It is important to keep the gum card dry at all times. If weather does not allow you to do this it is best to suspend sampling until dryer conditions prevail. A wet gum card should not be used because the scales will fall-off before a readable impression can be made.

A new scale card is started for each day. Even if a card is not filled a new card is still to be started for each day. Also, a different card is to be used for each location, i.e. Nelson Lagoon vs. Herendeen Bay. It is important that scale cards and numbers match the corresponding AWL sheet.

Scales

1. Clean the scale by wetting it and rubbing it between your fingers. Make sure no dirt, slime and skin (no silver color) remain on the scale.
2. Mount the scale on the gum card with the ridged side up. The ridged side is the same side that is exposed on the salmon.
3. One scale will be taken from sockeye and chum salmon. Three scales will be taken from chinook salmon, and four scales from coho salmon.
4. Take the preferred scale if it is available, if not available take a scale but note on the AWL form that it is not preferred.
5. Scales should be neat, clean, and orderly.

Age-Weight-Length (AWL) Sampling Form

Age -Scale samples are taken for age.

Weight -Taken to nearest tenth of a kilogram on any adult fish not being returned live to the water (if required).

Length -Taken with the fish laying flat from the mid-eye point to the fork of the tail (if required). Measure to the nearest millimeter.

Fill in all information on the AWL form and be sure length, sex, and weight data correspond to the appropriate scale.

APPENDIX B

Completion of Mark-Sense AWL Forms

Length, Sex, and Scale Sampling Procedure for Sampling: Using Mark-Sense Forms

INTRODUCTION

Salmon from terminal catches are sampled for length, sex, and scales annually. This data base is used as a tool to provide sound management of the salmon resources. To be useful, data must be recorded on the mark-sense forms neatly and accurately. The following procedures are to be followed when sampling for length, sex, and scales using mark-sense AWL forms.

COMPLETING THE FORMS:

Information needed to complete AWL forms, as well as examples of completed mark-sense AWL forms and accompanying gum cards for sampling commercial salmon catches from chinook, sockeye, and coho salmon are shown in Appendix B.1-B.5.

Complete each section of the left side of the mark-sense form using a soft No. 2 pencil and darken the corresponding blocks as shown in the figures. Make every effort to darken the entire block as partially filled blocks are often missed by the optical scanner which reads and records the data from the mark-sense AWL forms. If the blocks are not darkened properly, considerable time will be required later to edit these forms. Label only one form at a time to avoid "the carbon paper effect" and resulting stray marks.

Description:

For catch sampling: Area/Samplers (names)

Gum Card:

The AWL forms and corresponding gum card(s) are numbered sequentially by date throughout the season starting with 001 for each fishery. A separate numbering sequence will be used for each species, gear type, district, and geographic location. Consult your crew leader for the current card number. Sockeye and chum samples will have only 1 card per AWL form as shown in Appendix B.4. Coho and chinook samples will contain up to four cards per AWL form as shown in Appendix B.2 and B.5.

Species:

Refer to the reverse side of the AWL form for the correct digit.

Day, Month, Year:

Use appropriate digits for the date the fish are caught, not the date that they are processed.

District:

List only one district. Consult project leader for appropriate district and subdistrict numbers.

Subdistrict:

List a single subdistrict if it is known and all the fish sampled were from that single subdistrict. Leave it blank if more than one subdistrict is involved or if the subdistrict is unknown.

Stream:

Leave blank for catch sampling.

Location:

For catch sampling list the appropriate port code (Appendix B.1).

Period:

Refers to the calendar dates when the sample was harvested (not the sample date) as found in Appendix B.3.

Project:

Refer to the reverse side of the AWL form for the correct code.

Gear:

Refer to the reverse side of the AWL form.

Mesh:

Leave blank unless specifically instructed by supervisor to do otherwise.

Type of length measurement:

Use mid-eye to fork-of-tail (unless specifically instructed to do otherwise).

of cards:

Mark 1 when sampling sockeye and chum salmon (Appendix B). Mark 1A, 1B, 1C, or 1D when sampling chinook and coho salmon and write the card numbers perpendicular to the left of the fish # column as shown in Appendix B.

It is extremely important to keep the mark-sense forms flat, dry, and clean. Fish slime and water curling will cause data to be misinterpreted by the optical scanning reader machine. If unnecessary pencil marks, dark spots, etc. are visible, they need to be erased or else the machine will misinterpret the mark. It is necessary to completely fill in all information and darken the boxes (if needed) after each day.

Additional data columns are available on the reverse of the AWL for individual project use. If you take weights, you need to transfer the dark boxes on the front left margin of the form to the left margin on the back. This code needs to be exactly as it appears on the front.

GUM CARD(S):

Fill out the gum cards as shown in Appendices B.2, B.4, and B.5.

Species:

Write completely name of species (i.e., chinook, sockeye, etc.).

Location:

For catch sampling, write down area in which fish were caught followed by the word catch (ex. Herendeen Bay Catch).

Statistical code and Sampling date:

Transfer the appropriate digits from the AWL form.

Gear:

Write completely name of gear.

Collector(s):

Record the last name or initials of the person(s) sampling.

Remarks:

Record any pertinent information such as; number of scales per fish sampled, vessel/tender name, etc. Transfer this same information to the top margin of the AWL.

SAMPLING:

A. GENERAL

1. (WHEN REQUESTED BY AN AMB): Sex the fish and darken M or F in the sex columns. If any difficulty was encountered in this procedure, write "I had trouble sexing these fish" on the top margin of the AWL and ask your supervisor for help as soon as possible before sexing additional fish.
2. (WHEN REQUESTED BY AN AMB): Measure all species length in millimeters from the middle of the eye to the fork of the tail, refer to Appendix B. Record length by blackening the appropriate column blocks on the AWL form. Column 3 on the AWL form is used for fish over 999 millimeters long. Measure all species of salmon to the nearest mm. Check the calipers daily before use to ensure the accuracy of the measurements.
3. Pluck the "preferred scale" from the fish using forceps. Remove all slime, grit, and skin from the scale by moistening and rubbing between fingers. The "preferred scale" is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. Refer to Appendix B. If the "preferred scale" is missing, select a scale within the preferred area on either the left or right side of the fish.

If no scales are present in the "preferred area" on both sides of the fish, sample a scale as close to the preferred area as possible and darken the 8 under "age error code" on the AWL form.

4. Clean, moisten and mount scale on gum card directly over number 1 as shown in Appendix B. The side of the scale facing up on the gum card is the same as the side facing up when it was adhered to the fish. The exposed facing side is referred to as the "sculptured" side of the scale. The ridges on this sculpture side can be felt with a fingernail or forceps. Mount scale with anterior end oriented toward top of gum card.
5. When sampling sockeye and chum salmon repeat steps 1 through 4 for up to 40 fish on each AWL form.
6. When taking three scales per fish as with chinook or four scales per fish as with coho salmon sample the "preferred scale" and scale #2 and scale #3 as shown in Appendix B. Scale #2 is one inch to the left of the "preferred scale," scale #3 is located one inch to the right, and scale #4 is located between next to any of the other three preferred scales. All are two rows above the lateral line. Mount the three scales from fish #1 over 1, 11, and 21, or 31 if four scales are taken (coho), on the gum card as shown in Appendix B.5. Continuing, mount the 3 scales from fish #2 over 2, 12, and 22, etc.
7. Use plastic scale card holders to hold individual scale cards during sampling and cover the completed gum card with wax paper for storage.
8. Miscellaneous:
 - a. During wet conditions it is difficult to mount scales properly to get a good scale impression. Glue often obscures scale features and scales frequently adhere poorly to the card. Try to keep all the paperwork dry during this time. If the gumcard does get wet, the scales should be remounted.
 - b. For adipose clipped fish record the head tag number on the corresponding row in the first five columns on the reverse side of the AWL.
 - c. Look down the form from two angles after the data has been recorded to pick up any glaring mistakes. A common error occurs, for instance, in placing both the 4 and 7 of a 475 mm fish in the 100's column with nothing in the 10's column.
 - d. Keep all fish slime off forms and erase any stray marks on the forms before turning them in to your supervisor.
 - e. Write in all comments explicitly and completely under remarks, transfer remarks to top margin of AWL.

- f. Responsibility for accuracy lies first with the primary data collector(s). The supervisor will return sloppy or incomplete data to individual collectors. After editing a form, place your initials next to card #, but not in left margin. Editing these forms will save valuable time during the winter, and is an extremely important part of your job duties.
9. As soon as possible after completion send the samples and mark-sense forms to Port Moller. During scheduled radio calls before and following the sending of data, the crew leader will notify staff in Port Moller: (1) that the data is being mailed (use a moisture-proof container); (2) what data is being sent; (3) when delivery is expected in Port Moller; and (4) who is transporting the data. It is important that these steps are followed to ensure delivery.

SCALE SAMPLING CHECKLIST

Clipboard	Pencils (No. 2)	Gloves
Gum Cards	Forceps	Measuring board or calipers
AWL's	Wax paper inserts	Sampling Manual
Plastic scale card holders		

SOME REMINDERS

1. For greater efficiency in scale reading and digitizing, mount scales with anterior end toward top of scale card.
2. AWL's should be carefully edited before submitting. **This is extremely important, and cannot be emphasized enough.** Re-check header information on AWL's; make sure all available information is filled in. Take extra care to use the catch date and not sample date. Page numbers should not be repeated; a frequent error is to begin a week's sample with the last page number used the week before. This is particularly important if the data is regularly sent to town; it is easy to forget which numbers were used. Crew leaders should take time to ensure that the boxes are being blackened correctly, if the boxes are not darkened properly or sloppily marked the optical scanner records the information incorrectly or misses it entirely. Keep marks within each rectangle and completely fill them. Do not go outside the rectangle. After the AWL's are edited, place editor's initial next to page number, but not in left margin.
3. Check to make sure error codes (listed on back) are being used correctly, i.e. error code 7 is wrong species, error code 8 is a non-preferred scale. Error code 6 is for the use of the scale reader, it refers to the reabsorption of the scale.

4. Transfer important comments from scale cards to AWL's. After pressing scales, the cards are seldom referred to again, and important remarks can be lost. Write comments in the top margin (not on the left side) or on the reverse of the AWL. If no room is available on the AWL to completely explain the remarks, use a separate piece of paper.
5. Never put data from different dates on one AWL or one scale card. Even if only one scale is collected that day, begin a new card and AWL for the next day.
6. If weights are taken, they may be noted in the right margin of the AWL during sampling, but be sure to transfer the weights to the appropriate columns on the reverse of the AWL before submitting, **and darken in the litho code from the left front margin to the left back margin of the AWL form.**
7. The data processing program uses the litho code on the AWL. (It is located in the lower left margin of the AWL.) It helps if the AWL's are used in the order of this code. It should not be hard to keep them in order if they are arranged that way before page numbering. Those who sample different areas throughout the season can arrange the litho codes in order before each sample is taken.
8. If AWL's get wrinkled or blotched they should be copied over before sending to Port Moller. The optical scanning machine is extremely sensitive to wrinkles and blotches and will misread or reject the sheets.

Appendix B.1. Assigned port and weir location codes.

Port Codes

150 - King Cove
151 - Port Moller
152 - Dutch Harbor
153 - Akutan
154 - Sand Point
155 - Bear River, ADF&G Weir
156 - Nelson River, ADF&G Weir
157 - Canoe Bay
158 - Ilnik Lagoon, ADF&G Weir
159 - Orzinski River, ADF&G Weir
160 - Sandy River, ADF&G Weir
161 - Thin Point Lagoon, ADF&G Weir
162 - Middle Lagoon, ADF&G Weir

Species: Chinook Card No: 001
 Locality: Harbor Pt-Cape Seniavin
 Stat. Code: 315 - 151
 Sampling Date: Mo. 6 Day 10 Year 91
 Gear: _____
 Collector(s): TM, RM, SN
 Remarks: _____

DESCRIPTION: Chinook Harbor Seniavin

RTM WBM
 P: (MCM) SAMPLE DATE: 6/10/91

ADF&G ADULT SALMON AGE-LENGTH
 FORM VERSION 2.1

CARD:	001
SPECIES:	1
DAY:	10
MONTH:	6
YEAR:	91
DISTRICT:	315
SUBDISTRICT:	
STREAM:	
LOCATION:	151
PERIOD:	
PROJECT:	1
GEAR:	3
MESH:	
TYPE OF LENGTH MEASUREMENT	2
NUMBER SCALES/FISH	3
# OF CARDS	1

#	SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
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37						
38						
39						
40						

10	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
30	29	28	27	26	25	24	23	22	21
40	39	38	37	36	35	34	33	32	31

Appendix B.3. Periods and corresponding calendar dates, 1996.

Period	Calendar Dates	Period	Calendar Dates
1	01-Jan to 03-Jan	28	05-Jul to 11-Jul
2	04-Jan to 10-Jan	29	12-Jul to 18-Jul
3	11-Jan to 17-Jan	30	19-Jul to 25-Jul
4	18-Jan to 24-Jan	31	26-Jul to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Sep
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 04-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-May	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May to 06-Jun	50	06-Dec to 12-Dec
24	07-Jun to 13-Jun	51	13-Dec to 19-Dec
25	14-Jun to 20-Jun	52	20-Dec to 26-Dec
26	21-Jun to 27-Jun	53	27-Dec to 31-Dec
27	28-Jun to 04-Jul		

Species: Sockeye Card No: 015
 Locality: Nelson Lagoon
 Dist. Code: 313-22-151
 Sampling Date: Mo. 6 Day 19 Year 91
 Gear: TM, NH, SN
 Collector(s): TM, NH, SN
 Remarks:

DESCRIPTION: Sockeye Nelson Lgn

RMA READER RM
 W-4
 P-51 SAMPLE DATE 4/20/91

ADF&G ADULT SALMON AGE-LENGTH
 FORM VERSION 2.1

CARD: 015

SPECIES: 2

DAY: 11

MONTH: 6

YEAR: 91

DISTRICT: 313

SUBDISTRICT: 22

STREAM: 151

LOCATION: 151

PERIOD:

PROJECT: 1

GEAR:

MESH:

TYPE OF LENGTH MEASUREMENT: 1

NUMBER SCALES/FISH: 1

OF CARDS: 1

SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
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37					
38					
39					
40					

1	11	21	31
2	12	22	32
3	13	23	33
4	14	24	34
5	15	25	35
6	16	26	36
7	17	27	37
8	18	28	38
9	19	29	39
10	20	30	40

Appendix B. 4. Sockeye salmon AWL form and gumcard with one scale per fish.

Species: Coho Card No: 001
 Locality: Harbor PT - Cape Sardin
 Stat. Code: 315 - 151
 Sampling Date: Mo. 8 Day 18 Year 91
 Gear: _____
 Collector(s): T.M. MAA
 Remarks: _____

DESCRIPTION: Coho Harbor - Sardinia

R-VA

Reader: RM

P. J. MAA

Date 8/19

ADF&G ADULT SALMON AGE-LENGTH
FORM VERSION 2.1

CARD:	001
SPECIES:	3
DAY:	18
MONTH:	8
YEAR:	91
DISTRICT:	315
SUBDISTRICT:	
STREAM:	
LOCATION:	PM
PERIOD:	
PROJECT:	1
GEAR:	3
MESH:	
TYPE OF LENGTH MEASUREMENT	2
NUMBER SCALES/FISH	4
# OF CARDS	1

SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
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40					

10	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
30	29	28	27	26	25	24	23	22	21
40	39	38	37	36	35	34	33	32	31

APPENDIX C

Camp Policy

CAMP POLICY

1. No alcoholic beverages are to be stored in areas open to public view including cook tents. If alcohol is consumed at a camp an employee must be off-duty and under no circumstances shall he or she engage in the operation of any State equipment, including boats and motors nor shall he or she return to duty status under the influence of alcohol.
2. The crew leader of each sampling station shall establish a policy on living standards and personnel behavior in accordance with normal guidelines.
3. All sampling stations will operate as directed. No crew leader shall be off location for more than 24 hours unless specifically authorized by immediate supervisor. Time-off for individual crew members shall be scheduled by the crew leader and shall have the option as to whether sampling duties allow time-off from the location.
4. All employees will be required to act in a professional manner at all times and shall be especially courteous to the public.
5. It will be the responsibility of the crew leader to report any equipment abuse to the AMB and to ensure that abuse does not occur.

Additionally, the crew leader must also report within 24 hours any loss of equipment which occurs.

PERSONAL GEAR AND PETS

Generally 100 lbs. is a maximum for personal gear. If you anticipate bringing more than that amount to your field camp, check with your supervisor first. Pets shall not be brought to a catch sampling site unless approved beforehand.

Rabies is common on the Alaska Peninsula, be careful of all mammals including ground squirrels, fox, wolf, otters, and your pet. If bitten save the head of the animal if possible, wrap the head in several layers of plastic, put in a good box and freeze if possible. Notify your supervisor of the accident and your supervisor will send you into Anchorage if tests for rabies prove positive. Burn and bury remaining parts of the carcass away from water sources and cabins, take precautions such as wearing plastic gloves to

dispose of the carcass. Do not send suspected rabies animals out of your area unless you are bitten, burn and bury the carcass as instructed.

RADIO SCHEDULES

Radio schedules will be made twice during every day. Radio schedules are normally at 8:45 a.m. and 7:30 p.m. on 3.230 megahertz unless otherwise specified and are usually handled by staff in Port Moller, however, on occasion it may be necessary for the catch sampling crew to perform radio schedules. The King Cove crew is not required to participate in daily schedules but are requested to listen in on schedules when time permits. The morning schedule is used for passing along the current weather (visibility, ceiling, precipitation, etc.) and the previous days escapement counts. The evening schedule is used for updated escapement counts, grocery and supply orders, and the latest pertinent fishery announcements. All camps must complete the schedule within the time frame allowed, so we do not invade another areas time allotment. So, keep the conversation short. Personal conversation between camps should be arranged as not to interfere with any ADF&G schedules.

If a field camp does not respond to two consecutive radio schedules, the worst will be assumed and a plane will be dispatched.

FISH AND WILDLIFE VIOLATIONS

CONTACT A FISH & WILDLIFE PROTECTION OFFICER IMMEDIATELY IF POSSIBLE! This is not intended as an inclusive procedure for handling violations, it is not your job. Use this as a guideline for obtaining the necessary information and/or evidence to show and prove that a violation has been committed. It is important to be familiar with the commercial fishing, subsistence fishing, sport fishing, and hunting regulations in your area. Violation procedures are printed on the back cover of the commercial fishing regulation book. Request the regulation book if your camp does not have one.

The use of the 5 W's can greatly aid the Fish & Wildlife Protection officers in obtaining sufficient evidence for a case.

1. What is the violation?
2. When did the violation occur (date, time, tide condition, etc.)
3. Where did the violation occur?
4. Who is in violation and who are witnesses?
5. Why was the violation committed?

It is important that all witnesses to a violation be interviewed and all statements pertaining to a violation be recorded along with their names and

addresses. If you have a camera available, pictures are extremely valuable in prosecuting offenders. Collect as much information as possible and contact your supervisor or a State Trooper from the Fish and Wildlife Protection Division immediately. If you do not feel comfortable, or your personal safety may be in danger, do not pursue the violation. Contact your supervisor and they will handle the violation. Be aware that you do not have the power to arrest somebody and never attempt this.

FIREARMS

A State weapon will be provided at each location. You may bring your own firearm if you wish. Loaded guns are prohibited inside the camp facilities. Loaded, meaning a round in the chamber of the gun. Anyone handling a firearm should always treat it as if it were loaded. Guns should be kept clean and oiled and be completely unloaded while being cleaned. Any horseplay with or misuse of firearms while working for the Department of Fish and Game will not be tolerated and will be grounds for immediate dismissal. Completely unload a firearm of all rounds before entering a vessel or airplane. Keep an empty chamber under the firing pin of each pistol.

BEARS

Do not antagonize bears - each one is potentially dangerous. Do not encourage bears to come around camp by leaving food or unburned garbage around. Do not shoot at a bear unless, in your best judgment, he is endangering someone's life or damaging personal or state property. Use your best judgment on whether to shoot a bear if property is at stake. When, and if, trying to frighten a bear away by shooting - do not fire toward it. By chance, you may wound it by pulling the shot, ricochets, etc. If you are having problems with a particular bear around camp, call the office and notify them of the situation. The Game Division personnel will take care of the problem, if it is feasible.

TRANSPORTATION

Do not endanger life or property by going out in a boat on dangerously rough water. If you are unfamiliar with Marine Safety, ask for information or advice. All personnel must wear a life jacket when out on open water. Use your head - if you think it is dangerous, don't go out on the water.

Extra shear pins or propellers and a tool kit which includes pliers, spark plugs, and a spark plug wrench should be in the boat at all times. In case travel at night becomes necessary, carry a flashlight.

Some camps may be furnished with 3-wheel or 4-wheel all terrain vehicles (ATV's). The following safety precautions shall be observed at all times regarding Department ATV's. Only employees of the State may use the vehicles. Non-Fish and Game employees are not allowed on these vehicles at any time. Only one employee may ride on the vehicle at one time. Safety helmets are provided for all riders.

Review the Marine Safety and Light Aircraft Safety Manuals located at all camps before boating or flying. Do not get in a boat or plane if you feel uncomfortable with the situation. Consult the crew leader or pilot beforehand.

APPENDIX D

First Aid and Safety

FIRE AND FIRST AID

Check your camp's fire extinguisher. Know where it is and how to use it! Inventory your camp first aid kit, replace items as needed and become familiar with basic first aid treatment. Review the first aid booklet.

Take pains to avoid intestinal parasites carried by beaver and otter etc. When in doubt, boil your drinking water for a minimum of ten minutes.

APPEARANCE

Keep the facilities, surrounding area, and yourself clean and neat. Appearance is important even in remote camps. Impressions of visitors (public, visitors, officials, etc.) are often based on personal appearances. Do your best to look respectable and keep the grounds clean.

COMPATIBILITY OF FIELD PERSONNEL

If you find yourself unable to get along with other members at your camp, notify the appropriate supervisor and an attempt will be made to solve the problem. Usually, the person with the most experience in camp will be the crew leader. If it is not clear who has been designated crew leader in your camp ask your supervisor.

MEMORANDUM**STATE OF ALASKA**

To: Catch Sampling Crews

1996 FIELD CAMPS

From: Bob Murphy
Area Management Biologist
Division of Commercial Fisheries
Department of Fish & Game - Kodiak, Port Moller

SUBJECT: Health and Welfare of Crew Members

All employees must read the Safety Standard Operational Plans and other safety materials included and must be fully aware of all health and safety practices (e.g. basic first aid, location of fire extinguishers, etc.). More often than not, these obvious practices are ignored. With camps as they are, neglect of health practices can have serious ramifications if an employee were to become ill.

King Cove and Port Moller have medical clinics. Insurance forms will be available at both locations. Inform your supervisor immediately of any illness or injury that will require medical assistance or lost work time.

A State rifle or shotgun will be provided at each camp. You may bring your own firearm if you wish. Loaded guns are prohibited inside the camp facilities. Loaded, means a round in the chamber of the gun. Anyone handling a firearm should always treat it as if it were loaded. Guns should be kept clean and oiled and be completely unloaded while being cleaned. Any horseplay with or misuse of firearms while working for the Department of Fish and Game will not be tolerated and will be grounds for immediate dismissal. Completely unload a firearm of all rounds before entering a vessel or airplane. Keep an empty chamber under the firing pin of each pistol to prevent accidental discharge by accidentally dropping the weapon.

Do not antagonize bears - each one is a potential danger. Do not encourage bears to come around camp by leaving food or unburned garbage around. Do not shoot at a bear unless, in your best judgment, he is endangering someone's life or damaging personal or state property. Use your best

judgment on whether to shoot a bear if property is at stake. When, and if, trying to frighten a bear away by shooting near it. By chance, you may wound the animal accidentally. If you are having problems with a particular bear around camp, call the AMB and notify them of the situation. The Game Division personnel will take care of the problem, if it is feasible.

Port Moller has 3-wheel and 4-wheel all terrain vehicles (ATV's). The following safety precautions shall be observed at all times regarding Department ATV's. Only employees of the State may use the vehicles. Non-Fish and Game employees are not allowed on these vehicles at any time. The safety helmet provided must be worn during operation of an ATV. An ATV may provide transport of State materials, supplies, and equipment between camp sites and supply planes or vessels. In addition, they may be used for transportation to and from assigned duties in the field such as monitoring a fishery or collecting harvest information, etc. Recreational activities within reason are permitted but safety of the rider and vehicle must be adhered.

Check your camp's fire extinguisher. Know where it is and how to use it! Inventory your camp first aid kit, replace items as needed and become familiar with basic first aid treatment. Review the first aid booklet.

Keep the cabin, surrounding area, and yourself clean and neat. Appearance is important. You will not always be notified of the intended arrival of visitors, officials, etc. Impressions of visitors are often based on appearance.

Rabies is common on the Alaska Peninsula, be careful of all mammals including ground squirrels, fox, wolf, otters, and your pet. If bitten save the head of the animal if possible, wrap the head in several layers of plastic, put in a good box and freeze if possible. Notify your supervisor of the accident immediately. Burn and bury remaining parts of the carcass away from water sources and cabins, take precautions such as wearing plastic gloves to dispose of the carcass. Do not send suspected rabies animals out of your area unless you are bitten.

ALASKA PENINSULA SALMON EVALUATION AND ESCAPEMENT

SAMPLING OPERATING PROCEDURES, 1996



By:

Robert L. Murphy

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

April 1996

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	i
LIST OF APPENDICES	i
INTRODUCTION	1
OBJECTIVES	1
SUPERVISION	1
PERSONNEL	1
PROCEDURES	2
Escapement Enumeration	2
Bear River	2
Nelson River Weir	2
Nelson River Tower and Bear River Tower.....	3
Sandy River.....	
Ilnik River.....	4
Orzinski (Orzenoi) Lake.....	5
Middle Lagoon and Thin Point Projects.....	6
Escapement sampling for age, length, and sex composition	6
Smolt Sampling	6
General Camp Maintenance and Procedures	7
DATA REPORTING	7
APPENDICES	9

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Bear, Nelson, Sandy, Ilnik, Thinpoint, Middle Lagoon, and Orzinski escapement reporting form	8

LIST OF APPENDICES

	<u>Page</u>
APPENDIX A: SCALE SAMPLING TECHNIQUES.....	9
A.1 - Example of opscan form for Bear River	16
A.2 - Assigned port and weir location codes.	17
A.3 - Periods and corresponding calendar dates, 1996	18
A.4 - Measuring fish length.....	19
A.5 - Preferred scale sampling area on an adult salmon	20
APPENDIX B: PROCEDURE FOR SAMPLING SALMON SMOLT.....	21
B.1 - Example of opscan form for Bear River smolt.....	23
B.2 - Preferred scale sampling area on a smolt salmon	25
B.3 - Salmon smolt glass slide example	26
B.4 - Measuring smolt length.....	26
APPENDIX C: GENERAL EQUIPMENT, CAMP MAINTENANCE AND CAMP POLICY.....	27
APPENDIX D: A GUIDE TO THE COLLECTION AND IDENTIFICATION OF PRESALT PACIFIC SALMON IN ALASKA WITH AN ILLUSTRATED KEY.....	35

INTRODUCTION

The basic function of fisheries management is to allow effort on stocks with a harvestable surplus while protecting returning stocks with runs not meeting the minimum escapement requirements.

In 1996 weirs at Bear River, Nelson River, Sandy River, Ilnik River, Orzinski Lake, Middle Lagoon and Thin Point Cove will estimate and sample fish from the escapement.

OBJECTIVES

Long Term: To improve management of the salmon resources for the Alaska Peninsula and Aleutian Islands Management Areas through improved forecasting, development of stock-recruitment relationships to assess escapement requirements, and accurate assessment of stock composition.

Short Term:

1. Determine salmon escapement by species.
2. Determine the sockeye salmon age, length, and sex composition for the major systems within standard levels of precision.
3. Determine the age, length, and weight composition of sockeye smolt for Bear River, Sandy River, Ilnik River, and Orzinski River within standard levels of precision.

SUPERVISION

The Area Management Biologist (AMB) in Cold Bay, Arnie Shaul, will supervise the Middle Lagoon, Nelson Lagoon, and Thin Point Cove projects. The Area Management Biologist in Sand Point, Rod Campbell, will supervise the Orzinski River project. The Area Management Biologist (AMB) in Port Moller, Bob Murphy, will directly supervise the Bear River, Sandy River, and Ilnik River projects.

PERSONNEL

ADF&G will staff Bear River from about 25 May through 20 August, Nelson River from 20 May through 31 July, Sandy River from 25 May to 25 July, Ilnik Lagoon from 20 May through 25 July, Orzinski River from June 10 through August 10, and Thinpoint and Middle Lagoons from 1 July through late-July to mid-August. The personnel assigned to these projects are responsible for

enumerating the adult run and sampling adult and smolt salmon. Two people will be assigned to each project; additional assistance, if needed, will be provided.

PROCEDURES

Escapement Enumeration

Bear River

The 1996 weir will be placed in the same location as the 1995 weir. After the wooden tripods are in place, the tripod tables should be loaded with sand bags. After the stringers, pickets and catwalk are in place, sand bags should be stacked from the catwalk to the top of the tripod against the back legs of the tripod.

After the weir is fully operational, the counting tower should be made ready in case the weir washes out. The counting panels should be readily available and repainted if needed. Counting procedures, in an emergency, for Bear River tower would be the same as those described for Nelson River tower.

The main objective of the Bear River weir project is to record the number of salmon escaping into Bear Lake. Large numbers of fish (> 200) should not be allowed to stage behind the weir. If large numbers of fish (> 200) start to accumulate behind the weir, open up the weir and count them through.

Sockeye salmon under 16 inches (400 mm) in length (mid eye to tail fork) will be considered a jack. Use the counting form provided to record the data (Table 1). On the weir forms note the time period that the weir gates are opened and then closed, and the appropriate period and cumulative counts for adults, jacks, and other species also. Remarks such as weather, water levels, holes in the weir, and other comments should be included in the remarks column to the right of the page. Additional comments can be included at the bottom of the page. It is important to keep a daily log book (Rite-in-the-Rain) that has been provided with a more detailed description of the daily events. Cumulative daily counts and cumulative seasonal counts for each species will be relayed to Port Moller during normal radio schedules. When the project is completed send all forms to Port Moller.

Weir maintenance is very important to prevent weir washout. Keep the weir clean of debris and check the river substrate as often as possible to make sure escape holes do not occur. If the weir cannot be used for some reason, the tower should be used.

Nelson River Weir

The Nelson River weir will be manned from about 1 June through 31 July. The weir should be fish tight before salmon arrive (about mid-June).

After the weir is fully operational, the counting tower should be made ready in case the weir fails. The counting panels should be repainted annually and installed on the river bottom in the same location as in past years.

On the weir forms note the time period that the weir gates are opened and then closed, and the appropriate period and cumulative counts for adults, jacks, and other species also. Remarks such as weather, water levels, holes in the weir, and other comments should be included in the remarks column to the right of the page. Additional comments can be included at the bottom of the page. It is important to keep a daily log book (Rite-in-the-Rain) that has been provided with a more detailed description of the daily events. Cumulative daily counts and cumulative seasonal counts for each species will be relayed to Cold Bay during normal radio schedules. When the project is completed send all forms to Port Moller.

The main objective of the Nelson River weir is to record the number of salmon escaping into the Hoodoo Lake-Sapsuk River. Large numbers of fish (> 200) should not be allowed to stay behind the weir. If fish start to accumulate behind the weir, open up a fish gate and count them through. Two to four tally wackers may be necessary for counting sockeye adults, chum salmon, chinook, and coho salmon. Any sockeye salmon under 400 mm in length (mid eye to tail fork) will be considered a jack. Use the counting form provided to record all data.

As with Bear River, weir maintenance is important. Keep the weir clean of debris and check to insure the weir is fish tight. If the weir cannot be used, the tower and the procedures for the Nelson River Tower will be utilized.

Nelson River Tower and Bear River Tower

The Nelson River tower will be used if the weir is not operational. The first task will be to install the weir and paint and install the counting panels. Logbooks are provided for recording daily and cumulative count data.

Counting Procedures are as follows:

- | | |
|--------------------|--|
| <u>Hour One:</u> | Counts are made during the first 10 minutes and last 10 minutes of the hour. The counts are added together and multiplied by 3 to obtain the hour one estimate. |
| <u>Hour Two:</u> | No actual counts are made. The count is estimated by adding the last count in hour one to the first count in hour three and multiplying by 3. |
| <u>Hour Three:</u> | Counts are made during the first 10 minutes and last 10 minutes of the hour. The counts are added together and multiplied by 3 to obtain the hour three estimate. The same procedure as during hour one. |
| <u>Hour Four:</u> | No actual counts are made. The count is estimated by adding the last count in hour three to the first count in hour five and multiplying by 3. |

This procedure is repeated throughout the balance of the day until the last count. Due to poor visibility, caused by darkness during the end of the last hour, two 10 minute counts are made at the beginning of the hour. The first 10 minute count is used along with the last 10 minute count prior to the previous hour to calculate the previous hours count. To calculate the last hour's count, add the two 10 minute counts together and multiply by 3.

The night count estimate is made by averaging the last hourly count of day A with the first hourly count of day B, and multiplying the average by the number of night hours.

Calculate daily escapement and cumulative escapement when reporting counts over the radio. Calculations should be re-checked for errors.

Sandy River

The Sandy River weir site is 368 yards upstream of the cabin and in the same location as in 1995. The site will be staffed from about 1 June through 25 July. The tripods should be loaded with sand bags. After the stringers, pickets and catwalk are in place, sand bags should be stacked on top of the tripod against the back legs. A small deadhead should be secured on at least one side of the river, with a line secured through each leg of the tripods to prevent the tripods from washing downstream in case of a flood.

The main objective of the Sandy River weir project is to record the number of salmon escaping into the Ilnik River system. Large numbers of fish (> 200) should not be allowed to stage behind the weir. If fish start to accumulate behind the weir, open up the weir and count them through.

Weir maintenance is important at Sandy River to decrease the resistance on the weir. Keep the weir clean of debris and check it as often as needed to insure there are no holes for fish to escape. In the deeper channels, dry suits will be needed to visually inspect the weir to make certain that it is fish tight.

Sockeye salmon under 16 inches (400 mm) in length (mid eye to tail fork) will be considered a jack. Use the daily counting form provided to record the data (Table 1). On the weir forms note the time period that the weir gates are opened and the number of sockeye adults and jack and other species counted. Remarks such as weather, water levels, holes in the weir, and other comments should be included in the remarks column to the right of the page. Additional comments can be included at the bottom of the page. It is important to keep a daily log book (Rite-in-the-Rain) that has been provided with a more detailed description of the daily events. Cumulative daily counts and cumulative seasonal counts for each species will be relayed to Port Moller during normal radio schedules. When the project is completed send all forms to Port Moller.

Ilnik River

The Ilnik Lagoon weir will be staffed from about 20 May through 25 July. A portion (about 200-250') of the Ilnik River will have a new modified floating weir installed in conjunction with the tripod weir. The modified floating weir will used experimentally in 1996 and if successful, the new design will be expanded for the entire river for 1997. The floating and tripod weir will be integrated.

The main objective of the Ilnik Lagoon weir project is to record the number of salmon escaping into the Ilnik River system. Large numbers of fish (> 200) should not be allowed to stage behind the weir. If fish start to accumulate behind the weir, open up the weir and count them through.

Weir maintenance is extremely important at Ilnik to decrease the resistance on the weir. Due to the tidal influence, a large amount of debris tends to accumulate on the pickets. Keep the weir clean of debris and check it often to insure there are no holes for fish to escape. In the deeper channels, a dry suit will be needed to visually inspect the weir to make certain that it is fish tight.

If escapement sampling is not possible due to weather or other circumstances, upon approval from Port Moller, age (scales), sex, and length data will be collected from the set gillnet fishery in Ilnik Lagoon. Sockeye salmon under 16 inches (400 mm) in length (mid eye to tail fork) will be considered a jack. Use the daily counting form provided to record the data (Table 1). On the weir forms note the time period that the weir gates are opened and the number of sockeye adults, jacks, and other species counted. Remarks such as weather, water levels, holes in the weir, and other comments should be included in the remarks column to the right of the page. Additional comments can be included at the bottom of the page. It is important to keep a daily log book (Rite-in-the-Rain) that has been provided with a more detailed description of the daily events. Cumulative daily counts and cumulative seasonal counts for each species will be relayed to Port Moller during normal radio schedules. When the project is completed send all forms to Port Moller.

Orzinski (Orzenoi) Lake

The Orzinski Lake project will be supervised by the Sand Point Area Management Biologist (Rod Campbell). On the weir forms note the time period that the weir gates are opened and then closed, and the appropriate period and cumulative counts for adults, jacks, and other species counted. Remarks such as weather, water levels, holes in the weir, and other comments should be included in the remarks column to the right of the page. Additional comments can be included at the bottom of the page. It is important to keep a daily log book (Rite-in-the-Rain) that has been provided with a more detailed description of the daily events.

The main objective of the Orzinski River weir is to record the number of salmon escaping into Orzinski Lake. Large numbers of fish (> 200) should not be allowed to stay behind the weir. If fish start to accumulate behind the weir, open up a fish gate and count them through. Any sockeye salmon under 400 mm in length (mid eye to tail fork) will be considered a jack. Use the counting form provided to record all data.

Keep the weir clean of debris and check to insure the weir is fish tight. Cumulative and daily counts should be relayed to the Area Management Biologist in Sand Point. All forms should be sent to Sand Point and then forwarded to Port Moller.

Middle Lagoon and Thin Point Projects

Activities for the Middle Lagoon and Thin Point projects will be supervised by the Cold Bay Area Management Biologist (Arnie Shaul). A weekly 240 sockeye scale sample will be collected from each of these projects. When possible, the weekly sample should be collected on Monday. Subsequent days may be needed if poor weather is a factor. Sampling must be completed by Saturday. It is important to keep AWL forms and gum cards clean and dry. All forms should be sent to Cold Bay and then forwarded to Port Moller.

Escapement sampling for age, length, and sex composition

It is imperative that all scales collected match the length for that appropriate fish. Escapement sampling will be conducted by the crews stationed at Bear, Nelson, Sandy, Ilnik, and Orzinski Rivers, and Middle Lagoon and Thinpoint Cove. Sockeye salmon will be the primary species sampled. Samples will be collected using the weir live box trap or seining at Middle Lagoon and Thinpoint Cove. If the weir washes out, samples will be collected by seine if possible. Appendix A describes sampling and recording procedures.

The sample goal is 240 adult sockeye salmon per week for each system. In 1996 the standard week is Thursday to Monday. Sampling should begin on Thursday and be completed that day, if possible. If it is not completed due to a variety of reasons such as wind or rain, subsequent days should be sampled to obtain the 240 fish sample. If all samples cannot be collected on Thursday, continue to collect samples on subsequent days until the goal is reached.

Samples will consist of scales, length, and sex data. Scales will be correctly mounted on the gumcard to the corresponding fish number on the AWL form. Length data will be from the mid eye to the fork-in-the-tail. Sex data will be determined by kype (nose) development or visual determination of eggs or milt. Training for new employees in these samples will be performed by experienced personnel or one of the field offices.

Smolt Sampling

Out-migrating sockeye smolt will be collected at Bear Lake, Sandy and Orzinski Rivers. After the weirs are operational, sampling will begin. A weekly sample size of 200 smolt will be collected during the duration of the smolt out-migration, which will probably last 4 to 6 weeks. Smolt will be sampled for age, weight, and length composition. Appendix B gives sampling and recording procedures. Sampling will begin on Friday, the day after the completion of adult sampling. Estimate the peak migration, and note if the migration is relatively light, moderate, or heavy.

The fyke net should be located in swift moving current so the water velocity is just below the washout threshold of the net. A good procedure is to attach the net behind the weir using the tripods as a support for the net. The net will be fished as long as it is necessary to capture 200 smolt. Near dusk is

when out-migration usually peaks. If 200 smolt are not captured on Friday, sampling will continue until the goal is met or the week terminates. Check the net frequently to avoid unnecessary mortality.

It is important to fill out the backs of the AWL forms when weights are recorded. The numbers (litho code) on the front left-hand margin need to be copied to the back left-hand margin when weights are recorded on the back of the form. Weight must be recorded to 1/10 th of a gram.

General Camp Maintenance and Procedures

During the season, the duties outlined above may take longer than 37.5 hours/week to accomplish. When this happens at Bear River, Sandy River, or Ilnik River, notify Bob Murphy, at Nelson River, Middle Lagoon, or Thinpoint Cove notify Arnie Shaul, and at Orzinski River notify Rod Campbell. They will decide what projects take priority and whether to authorize overtime. No additional overtime may be worked or claimed unless it is first authorized.

Cabin and facilities maintenance is an important aspect of being able to accomplish objectives comfortably. Maintenance can usually be accomplished during slow periods of the season. As soon as the camp is established, look the situation over and make a list of projects that need to be accomplished. Send in a list of materials needed for these jobs. Also, try to anticipate problems before they occur. Ordering replacement parts, before a deteriorating piece of equipment actually breaks, will prevent long delays in repair due to the logistics involved.

Appendix C provides general information including radio schedules, ordering food and supplies, compliance with ADF&G regulations, equipment/maintenance, procedures regarding violations, emergencies, firearms, bears, garbage, boating, fire and first aid safety, drinking water, personal gear, compatibility of field personnel, and cleanliness of cabin.

DATA REPORTING

Patricia Nelson and Bob Murphy will author a Regional Information Report which covers the results of the 1996 escapement sampling season.

Table 1. Bear, Nelson, Sandy, Ilnik, Thinpoint, Middle lagoon, and Orzinski escapement reporting form.

Date: Time Period	Daily Sockeye				Daily Other		Remarks: weather, number of fish sampled, water level, holes in weir, etc.
	Adult		Jack		Period	Cumulative	
	Period	Cumulative	Period	Cumulative			
Total	Sockeye Daily Total		Sockeye Cumulative		Daily Other		Cumulative Other
	Adult		Adult		Chinook	Chum	Chinook
	Jacks		Jacks		Pink	Coho	Pink
							Coho

Note: Do not lump other species, separate by species.

If another form is needed for one day, please make note that there are 2 pages at the top of each form.

APPENDIX A

Scale Sampling Techniques

ALASKA PENINSULA SCALE SAMPLING TECHNIQUE

The following is an explanation of how salmon scale samples are taken. If you have not taken scales before or if you have any questions ask somebody who has had experience with scale sampling. Scales must be readable to be useful, so follow proper technique when sampling.

IMPORTANT POINTS TO REMEMBER

Gum Cards

A scale card is a gum-backed sheet numbered 1 through 40. Samples are placed on the cards with no attempt to separate the fish by their sex.

It is important to keep the gum card dry at all times. If weather does not allow you to do this, it is best to suspend sampling until dryer conditions exist. A wet gum card is useless as the scales will fall off and prevent a readable impression from being taken.

A new scale card is started for each day. Even if a card is not filled, a new card is still to be started for each day. Also, a different card is to be used for each location, i.e. Bear River versus Nelson River. It is important that scale cards and numbers match the corresponding AWL sheet.

Scales:

1. Clean the scale by wetting it and rubbing it between your fingers. Make sure no dirt, slime, and skin (no silver color) remains on the scale.
2. Mount the scale on the gum card with the ridged side up. The ridged side is the same side that is exposed on the salmon.
3. One scale will be taken from sockeye and chum salmon. Three scales will be taken from chinook salmon and four from coho salmon.
4. Take the preferred scale if it is available, if they are not available, take a scale in an area close to the preferred area, but note that it is not preferred.
5. Scales should be neat, clean, and orderly.

Age-Weight-Length (AWL) Sampling Form

- Age - Scale samples are needed to age the fish.
- Weight - Recorded to the nearest tenth of a pound on any adult fish not being returned live to the water. Recorded to the nearest 1/10 th of a gram on smolt.
- Length - Recorded to the nearest millimeter from the mid-eye point to the fork in the tail.

Fill in all information on the AWL form.

Each AWL form must match up with the appropriate scale card.

Length, Sex, and Scale Sampling Procedure for Sampling: Using Mark-Sense Forms

Salmon from the catch are sampled for length, sex, and age annually by field crews throughout the state. This data base is essential for sound management of the States' salmon resources. To be useful, data must be recorded on the mark-sense forms neatly and accurately. The following procedures are to be adhered to when sampling for length, sex, and scales using mark-sense AWL forms (Appendix A.1.-A.5).

COMPLETING THE FORMS:

A completed mark-sense AWL form (Appendix A.1) and accompanying gum card for sampling escapement of sockeye and chum salmon are to be completed for each form.

Complete each section of the left side of the mark-sense form using a soft No. 2 pencil and darken the corresponding blocks as shown in the figures. It is imperative that you darken the box completely and neatly. **The number inside the box should be completely darkened.** Make every effort to darken the entire block because partially filled blocks are often missed by the optical scanner which reads and records the data from the mark-sense AWL forms. Label only one form at a time to avoid "the carbon paper effect" and resulting stray marks. It is necessary to review the forms after each day and ensure that all the data is filled in and appropriately marked.

Description:

For escapement sampling: Species/Area/Catch or Escapement/gear type i.e. weir/Samplers (W-R-P).

Card:

The AWL forms and corresponding gum card(s) are numbered sequentially by date throughout the season starting with 001. A separate numbering sequence will be used for each species, gear type, district, and geographic location. Consult your crew leader for the current card number. Sockeye and chum samples will have only 1 card per AWL form.

Species:

Refer to the reverse side of the AWL form for the correct digit. Day, Month, Year: Use appropriate digits for the date the fish are caught.

District:

List only one district. Consult your supervisor for appropriate district, sub-district, and stream numbers.

Subdistrict:

List a single sub-district if it is known and all the fish sampled were from that single sub-district. Leave blank if more than one sub-district is involved or if the subdistrict is unknown.

Stream:

Consult your supervisor for appropriate number or write the stream name on the AWL form and gum card..

Location:

List the appropriate code as shown in Appendix A.2.

Period:

List the appropriate number from the calendar date in Appendix A.5.

Project:

Refer to the reverse side of the AWL form for the correct code.

Gear:

Refer to the reverse side of the AWL form.

Mesh:

Leave blank.

Type of length measurement:

Use mid-eye to fork of tail (Appendix A.3).

of cards:

Mark 1 when sampling sockeye and chum salmon (Appendix A.1).

It is extremely important to keep the mark-sense forms flat, dry, and clean. Fish slime and water curling will cause data to be misinterpreted by the optical scanning reader machine. If unnecessary pencil marks, dark spots, etc. are visible, they need to be erased or else the machine will misinterpret the mark. It is necessary to completely fill in all information and darken the boxes (if needed) after each day.

Additional data columns are available on the reverse of the AWL for individual project use. If you take weights, you need to transfer the dark boxes on the front left margin of the form to the left margin on the back. This code needs to be exactly as it appears on the front.

GUM CARD(S):

Fill out the gum cards.

Species:

Write out completely (i.e., chinook, sockeye, etc.).

Locality:

For catch sampling, write down area in which fish were caught followed by the word catch (e.x.. Herendeen Bay Catch).

Statistical code and Sampling date:

Transfer the appropriate digits from the AWL form.

Gear:

Write out completely.

Collector(s):

Record the last name or initials of the person(s) sampling.

Remarks:

Record any pertinent information. Transfer this same information to the top margin of the AWL.

SAMPLING:**A. GENERAL**

1. Sex the fish and darken M or F in the sex columns. If any difficulty was encountered in this procedure, write "I had trouble sexing these fish" on the top margin of the AWL and ask your supervisor for help as soon as possible before sexing additional fish.
2. Measure all species length in millimeters from the middle of the eye to the fork of the tail, refer to Appendix A.3. Record length by blackening the appropriate column blocks on the AWL form. Column 3 on the AWL form is used for fish over 999 millimeters long. Measure all species of salmon to the nearest mm. Check the calipers daily before use to ensure the accuracy of the measurements.
3. Pluck the "preferred scale" from the fish using forceps (Appendix A.4). Remove all slime, grit, and skin from the scale by moistening and rubbing between fingers. The "preferred scale" is located on the left side of the fish, two rows above the lateral line on the diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. If the "preferred scales" are missing, select another fish.
4. Clean, moisten and mount scale on gum card directly over number 1. The side of the scale facing up on the gum card is the same as the side facing up when it was adhered to the fish. The exposed facing side is referred to as the "sculptured" side of the scale. The ridges on this sculpture side can be felt with a fingernail or forceps. Mount scale with anterior end oriented toward top of gum card.
5. When sampling sockeye and chum salmon repeat steps 1 through 4 for up to 40 fish on each AWL form.

6. Use plastic scale card holders to hold individual scale cards during sampling and cover the completed gum card with wax paper for storage.
7. When sampling at a weir, you may use the old AWL forms or field notebook to record the data. Keep the mark-sense forms in camp where they will be clean, dry, and flat. After sampling is done for the day transfer the data to the mark-sense forms on a daily basis. It is the responsibility of the data collector to transcribe the data before turning it over to the immediate supervisor.
8. Miscellaneous:
 - a. When salmon scales are sampled in wet conditions it is difficult to mount scales in a way to make a good scale impression. Glue often obscures scale features and scales frequently adhere poorly to the card. Try to keep all the paperwork dry during this time. If the gum card does get wet, the scales should be remounted.
 - b. For adipose clipped fish record the head tag number on the corresponding row in the first five columns on the reverse side of the AWL.
 - c. Look down the form from two angles after the data has been recorded to pick up any glaring mistakes. A common error occurs, for instance, in placing both the 4 and 7 of a 475 mm fish in the 100's column with nothing in the 10's column.
 - d. Keep all fish slime off forms and erase any stray marks on the forms before turning them in to your supervisor.
 - e. Write in all comments explicitly and completely under remarks, transfer remarks to top margin of AWL.
 - f. Responsibility for accuracy lies first with the primary data collector(s). The port supervisor will return sloppy or incomplete data to individual collectors. After editing a form, place your initials next to card #, but not in left margin. Editing these forms will save valuable time editing during the winter, and is an extremely important part of your job duties.
9. As soon as possible after completion (or at the end of the season) send the samples and mark-sense forms to Port Moller. During scheduled radio calls before and following the sending of data to, the crew leader will notify Port Moller: (1) that the data is being mailed (use a moisture-proof container); (2) what data is being sent; (3) when delivery is expected in Port Moller; and (4) who is transporting the data. It is important that these steps are followed to ensure delivery.

SCALE SAMPLING CHECKLIST

Clipboard	Pencils (No. 2)	Gloves
Gum Cards	Forceps	Measuring board or calipers
AWL's	Wax paper inserts	Sampling Manual
Plastic scale card holders		

SOME REMINDERS

1. For greater efficiency in scale reading and digitizing, mount scales with anterior end toward top of scale card.
2. AWL's should be carefully edited before submitting to Port Moller. **This is extremely important, and cannot be emphasized enough.** Re-check header information on AWL's; make sure all available information is filled in. Take extra care to use the catch date and not sample date. Page numbers should not be repeated; a frequent error is to begin a week's sample with the last page number used the week before. This is particularly important if the data regularly is sent to town; it is easy to forget which numbers were used. Crew leaders should take time to ensure that the boxes are being blackened correctly, if the boxes are not darkened properly or sloppily marked the optical scanner records the information incorrectly or misses it entirely. Keep marks within each rectangle and completely fill them. Do not go outside the rectangle. After the AWL's are edited, place editor's initial next to page number, but not in left margin.
3. Transfer important comments from scale cards to AWL's. After pressing scales, the cards are seldom referred to again, and important remarks can be lost. Write comments in the top margin (not on the left side) or on the reverse of the AWL. If no room is available on the AWL to completely explain the remarks, use a separate piece of paper.
4. Never put data from different dates on one AWL or one scale card. Even if only one scale is collected that day, begin a new card and AWL for the next day.
5. If weights are taken, they may be noted in the right margin of the AWL during sampling, but be sure to transfer the weights to the appropriate columns on the reverse of the AWL before submitting it to Port Moller, and darken in the code from the left margin of to the back of the form.
6. The data processing program uses the "litho code" on the AWL. (It is located in the lower left margin of the AWL.) It helps if the AWL's are used in the order of this code. It should not be difficult to keep them in order if they are arranged that way before page numbering. Those who sample different areas throughout the season can arrange the litho codes in order before each sample is taken.
7. If AWL's get wrinkled or blotched they should be copied over before submitting to Port Moller. The optical scanning machine is extremely sensitive to wrinkles and blotches and will misread or reject the sheets.

DESCRIPTION: BEAR River
Sockeye

WRENN TC
SCALE RUCKER TB
RECORDING TC

PM

ADF&G ADULT SALMON AGE-LENGTH
FORM VERSION 2.1

CARD:	021
SPECIES:	2
DAY:	1
MONTH:	7
YEAR:	91
DISTRICT:	315
SUBDISTRICT:	11
STREAM:	002
LOCATION:	055
PERIOD:	
PROJECT:	3
GEAR:	WERNER
MESH:	
TYPE OF LENGTH MEASUREMENT	2
NUMBER SCALES/FISH	1
# OF CARDS	1

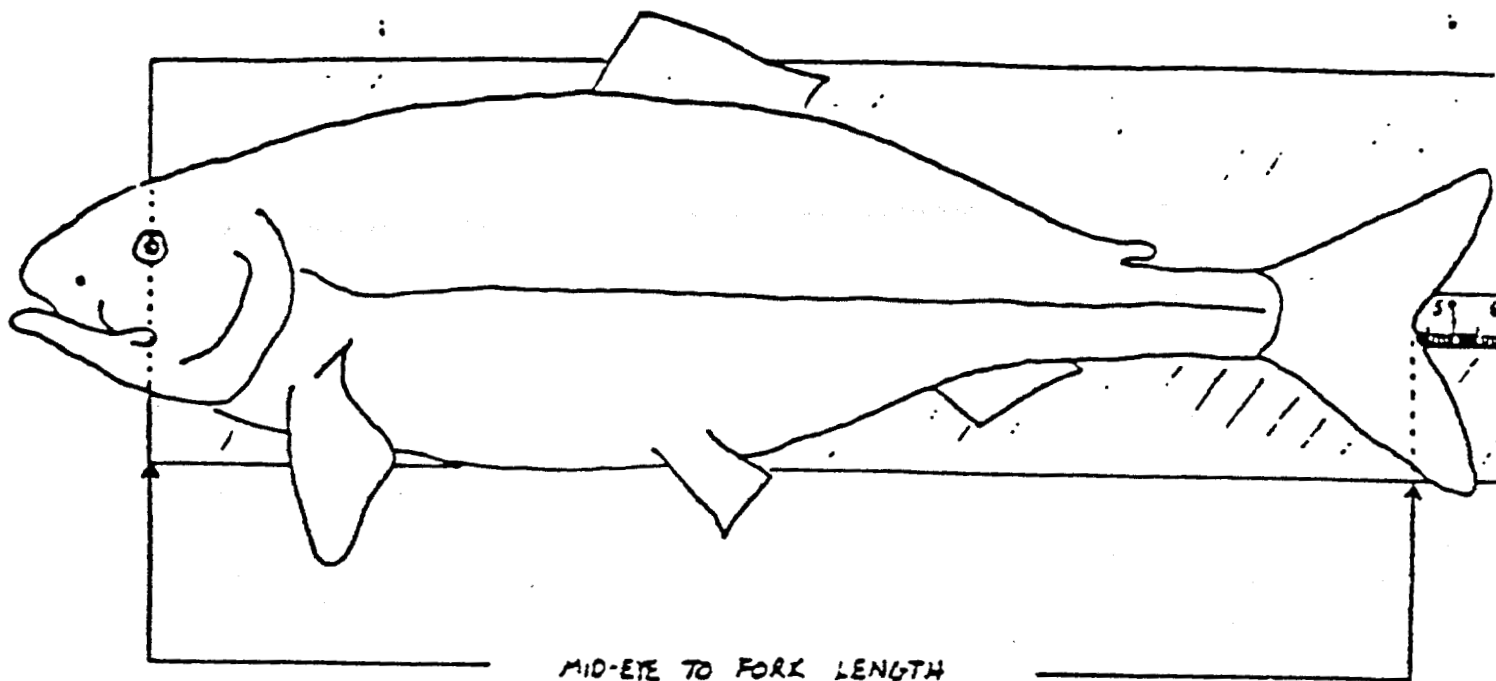
	SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
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3						
4						
5						
6						
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11						
12						
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Appendix A.2. Assigned port and weir location codes.

150 - King Cove
151 - Port Moller
152 - Dutch Harbor
153 - Akutan
154 - Sand Point
155 - Bear River, ADF&G Weir
156 - Nelson River, ADF&G Weir
157 - Canoe Bay
158 - Ilnik River, ADF&G Weir
159 - Orzinski Lake, ADF&G Weir
160 - Sandy River, ADF&G Weir
161 - Thinpoint Lagoon, ADF&G Weir
162 - Middle Lagoon, ADF&G Weir

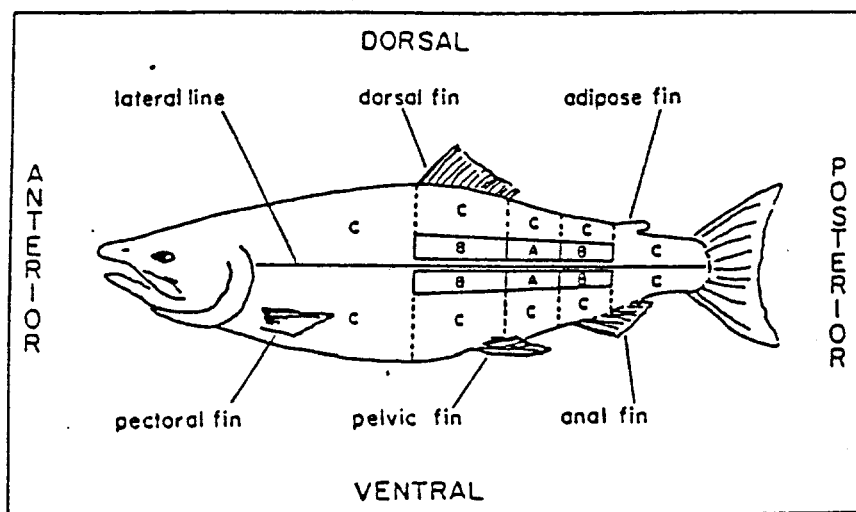
Appendix A.3. Periods and corresponding calendar dates, 1996.

Period	Calendar Dates	Period	Calendar Dates
1	01-Jan to 03-Jan	28	05-Jul to 11-Jul
2	04-Jan to 10-Jan	29	12-Jul to 18-Jul
3	11-Jan to 17-Jan	30	19-Jul to 25-Jul
4	18-Jan to 24-Jan	31	26-Jul to 01-Aug
5	25-Jan to 31-Jan	32	02-Aug to 08-Aug
6	01-Feb to 07-Feb	33	09-Aug to 15-Aug
7	08-Feb to 14-Feb	34	16-Aug to 22-Aug
8	15-Feb to 21-Feb	35	23-Aug to 29-Sep
9	22-Feb to 28-Feb	36	30-Aug to 05-Sep
10	01-Mar to 07-Mar	37	06-Sep to 12-Sep
11	08-Mar to 14-Mar	38	13-Sep to 19-Sep
12	15-Mar to 21-Mar	39	20-Sep to 26-Sep
13	22-Mar to 28-Mar	40	27-Sep to 03-Oct
14	29-Mar to 04-Apr	41	04-Oct to 10-Oct
15	05-Apr to 11-Apr	42	11-Oct to 17-Oct
16	12-Apr to 18-Apr	43	18-Oct to 24-Oct
17	19-Apr to 25-Apr	44	25-Oct to 31-Oct
18	26-Apr to 02-May	45	01-Nov to 07-Nov
19	03-May to 09-May	46	08-Nov to 14-Nov
20	10-May to 16-May	47	15-Nov to 21-Nov
21	17-May to 23-May	48	22-Nov to 28-Nov
22	24-May to 30-May	49	29-Nov to 05-Dec
23	31-May to 06-Jun	50	06-Dec to 12-Dec
24	07-Jun to 13-Jun	51	13-Dec to 19-Dec
25	14-Jun to 20-Jun	52	20-Dec to 26-Dec
26	21-Jun to 27-Jun	53	27-Dec to 31-Dec
27	28-Jun to 04-Jul		

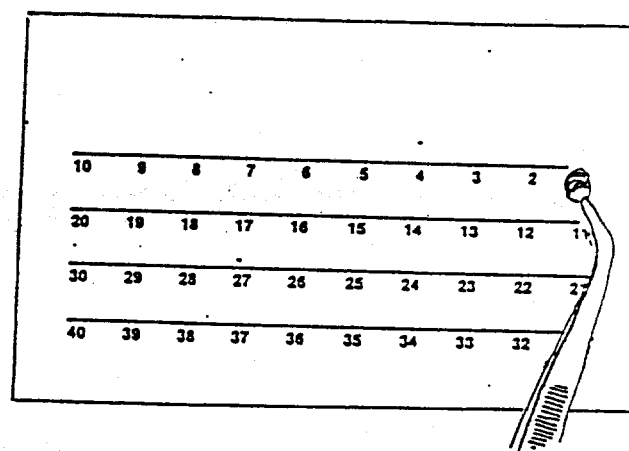
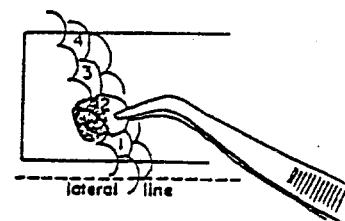
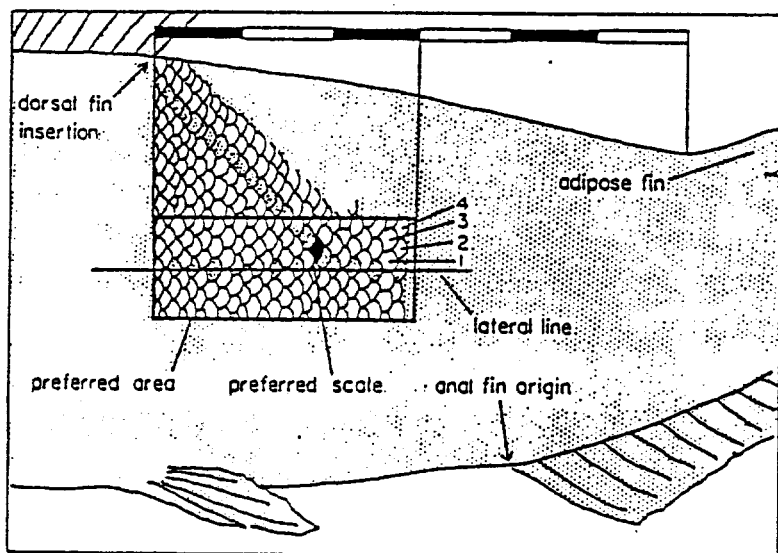


Because the length and form of the snout of salmon changes as the fish approaches sexual maturity, length measurements are made from the middle of the eye to the fork of the tail. The length is always recorded to the nearest millimeters. The procedure for measuring length (mid-eye to fork) of the salmon is as follows:

1. Place the salmon flat on the board with the head to your left and the dorsal fin away from you.
2. Make sure your eye is directly over the end of the board. Line the eye of the salmon up with the edge of the board and hold the head in place with your left hand. It helps to place a finger in the salmon's eye for reference.
3. Flatten and spread the tail against the board with your right hand.
4. Read the mid-eye to fork length to the nearest five millimeters.



DO NOT TURN SCALE OVER



Place scales directly over number on gumcard. Mount scales with anterior portion of scale oriented toward top of card.

Appendix A.5. Preferred scale sampling area on an adult salmon.

APPENDIX B

Procedure for Sampling Salmon Smolt

Once the field camp is established, sockeye smolt will be sampled for length, weight, and age data on a weekly basis during the peak outmigration. Smolt sampling will terminate when less than 10 smolt are captured over a 24 hour period, and after consulting with your supervisor.

Two hundred smolt will be sampled per week. When more than 200 smolt are captured in the fyke net, place the smolt in a large container and gently stir the smolt. Randomly remove a portion of the catch and sample. Stop this procedure when 200 smolt are sampled. Return the remaining smolt back to the river.

Smolt will be worked up the day following capture. A smolt sampling day encompasses the 24 hours between noon of one day to noon of the following day, and is identified by the calendar date corresponding to the first 12 hour period. Age, weight, and length data will be recorded on adult AWL forms (Appendix B.1). Refer to Appendix B.1 of the standard procedures for recording data on AWL forms. Record at the top of each form: personnel collecting the data, length of time the gear was fished (in hours), the hours from/to the gear was fished, approximate numbers of sockeye smolt and other species captured.

Use a knife to remove 5-10 scales from the preferred area (Appendix B.2). Mount the scales on a glass slide (Appendix B.3). Label the left portion of the slide with: location, date, specimen number, and collectors.

Measure smolt length from the tip of the snout to the fork of the tail, in the nearest millimeter (Appendix B.4).

Blot excess water from the smolt with a paper towel before weighing. **Weights will be recorded to the nearest 1/10 of a gram.** Weights are recorded on the back of the AWL form in the three columns from the right as found in Appendix B.1.

DESCRIPTION:

Bear Lake Smolt

W: RD
P: JF
R: RBADF&G ADULT SALMON AGE-LENGTH
FORM VERSION 2.1

CARD:	001
SPECIES:	2
DAY:	06
MONTH:	07
YEAR:	92
DISTRICT:	315
SUBDISTRICT:	11
STREAM:	002
LOCATION:	055
PERIOD:	
PROJECT:	3
GEAR:	Web trap
MESH:	
TYPE OF LENGTH MEASUREMENT	1
NUMBER SCALES/FISH	1
OF CARDS	1

#	SEX	100's	LENGTH	1's	AGE GROUP	AGE ERROR CODE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
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37						
38						
39						
40						

Appendix B.1. Example of opscan form for Bear River smolt.

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS AREA

234146

24

**TRANSFER RESPONSES
EXACTLY AS PRINTED
ON FRONT TO THIS GRID**

DO NOT WRITE IN THIS AREA

Weight (g)

[illegible]

SPECIES

- 1 - Chinook (king)
2 - Sokeya (red)
3 - Cahu (silver)
4 - Pink (humpy)
5 - Chum (dog)

PROJECT

- 1 - Commercial catch
- 2 - Subsistence catch
- 3 - Escapement (lower, weir, sonar site, etc)
- 4 - Escapement spawning grounds
- 5 - Fast fishing
- 6 - Sport catch (marine)
- 7 - Sport catch (freshwater)

GEAR TYPE

- | | |
|-----------------------------|--------------------|
| 0 - Trap | 11 - Missing purse |
| 1 - Purse seine | seine |
| 2 - Beach seine | 12 - Handpicked |
| 3 - Drift gillnet | 13 - Dip net |
| 4 - Set gillnet | 14 - 16 Unassigned |
| 5 - Trawl | 17 - Beam trawl |
| 6 - Long line | 18 - Shovel |
| 7 - Otter trawl | 19 - Weir |
| 8 - Fishwheel | 20 - 99 Unassigned |
| 9 - Pots | |
| 10 - Sport hook
and line | |

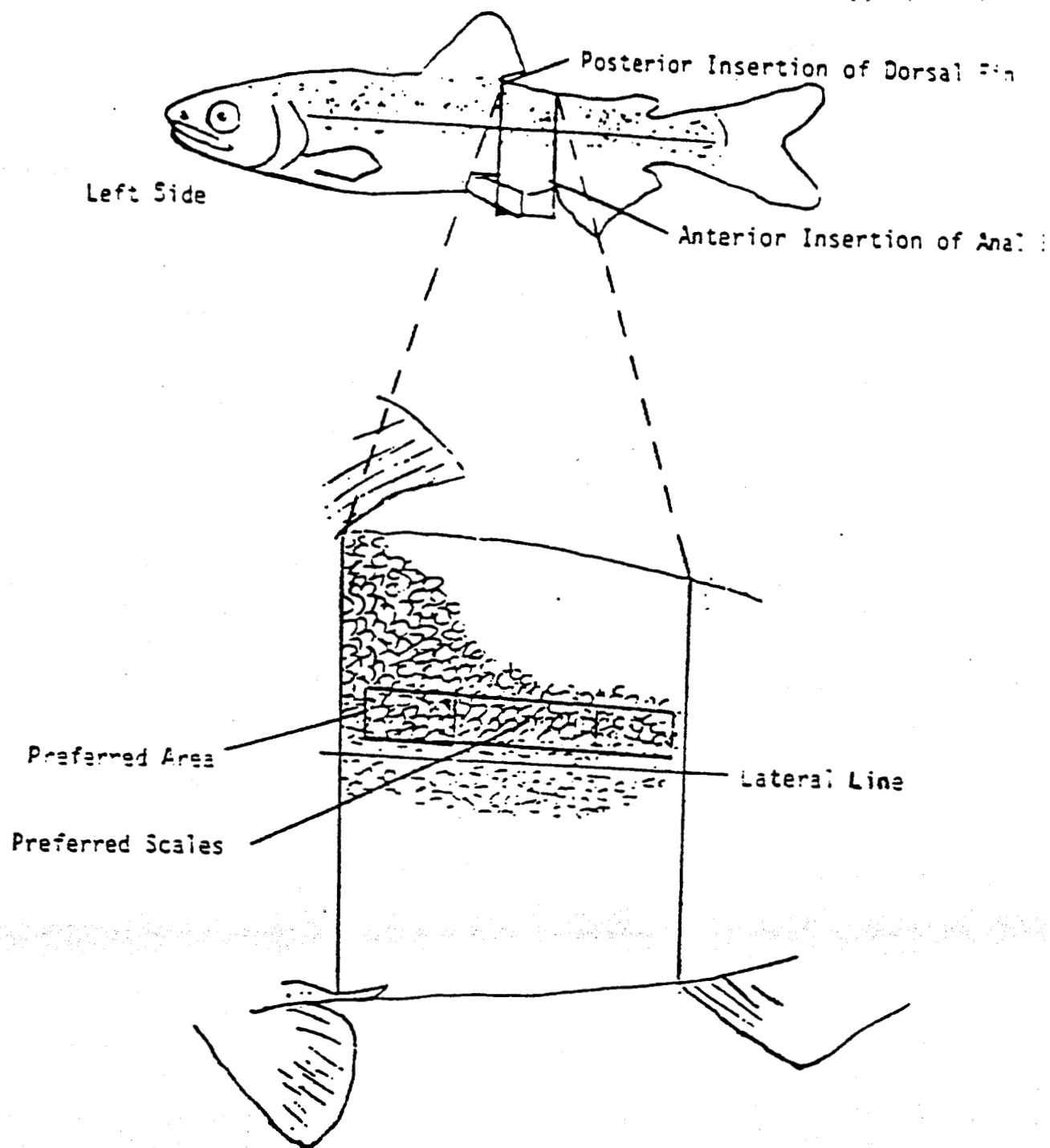
LENGTH TYPE

- 1 - Tip of snout to fork of tail
2 - Mid eye to fork of tail
3 - Post orbit to fork of tail
4 - Mid eye to hypural plate
5 - Post orbit to hypural plate
6 - Unassigned

AGE ERROR CODES

- 1 - Otolith
2 - Inverted
3 - Regenerated
4 - Illegible
5 - Missing
6 - Reabsorbed
7 - Wrong species
8 - Not preferred

Appendix B.2. Preferred scale sampling area on a smolt salmon.

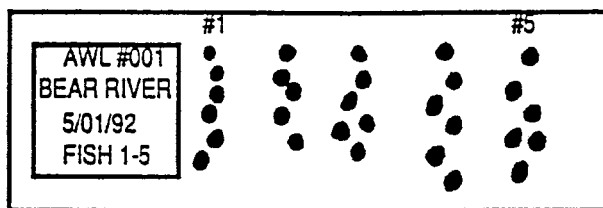


Appendix B.3

Salmon smolt glass slide example.

The following information should be legibly written on the slide label:

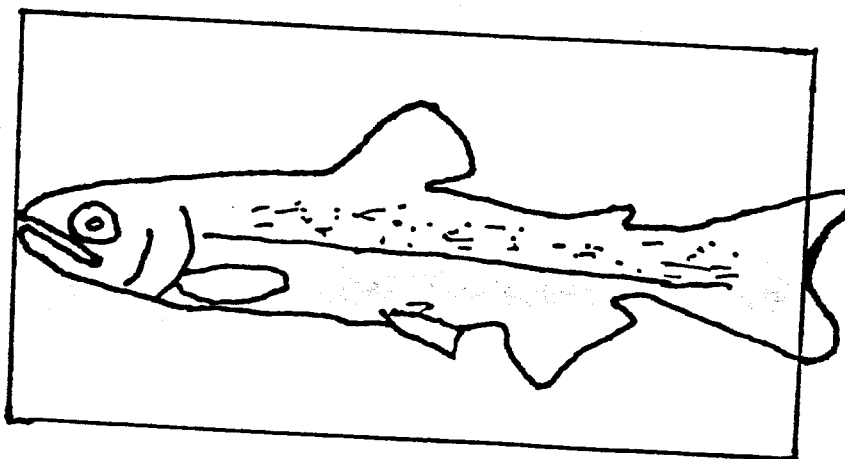
1. AWL #
2. Location
3. date (mo/day/yr)
4. Fish # (1-5, 6-10, etc.)



When the slides are completed, return them to the box in order by AWL #, date, and fish #.
Label the slide box on top with the following information:

LOCATION (BEAR RIVER)
AWL NUMBERS (AWL # 001 - 010)
BEGINNING AND ENDING DATES (5/01 - 5/06/92)

Appendix B.4. Measuring smolt length.



4th

APPENDIX C

General Equipment, Camp Maintenance and Camp Policy

Equipment Maintenance

Equipment maintenance is perhaps one of the most important operations you will perform during the field season. The outboard motors and generators must be kept in good operating condition.

It will be the crew leader's responsibility to assign the most knowledgeable member of the crew to the job of maintaining and servicing the equipment. It will be this person's responsibility to see that all equipment is kept in operating condition.

Outboard Motors

Your outboard motor will perform longer and give less trouble if these suggestions are followed:

1. The correct outboard fuel mixture is 50:1. Always pour the oil into the tank first, then add 2 or 3 gallons of gas and mix thoroughly, then fill tank to capacity always using a large funnel and chamois filter.
2. Chain saws have a fuel mixture 25:1. Chain saw gas should be mixed in a 5 gallon can and clearly marked that it is chain saw fuel.
3. When mixing gasoline or filling the tanks of the generator, stove or lantern, keep the following in mind:
 - a. Always mix fuel tanks or equipment under cover to prevent water contamination and always use a funnel and filter.
 - b. Fill camp stoves and lanterns outside as the danger of fire is very real.
 - c. A little extra effort toward cleanliness will pay in hours of trouble free operation.
4. Always place outboard motors in neutral when starting and always make sure a safety line is attached to the boat and motor.
5. Check daily the clamp screws that hold the outboard to the transom. Also routinely check the motor for loose screws and bolts, cracks, and breaks, especially in the area of the lower unit.
6. Never start or run an outboard in the tilted position.
7. In the normal operation of a water pump, a "tell-tale" stream of water is discharged from a hole in the bottom edge of the cowling or from the back of the shaft. If this stream of water stops, the water pump is not working and the motor should be shut off. The side plate over the water intake can be removed for temporary relief as it may be plugged. If the pump continues not to function, the outboard should not be run, and a report to base camp should be made.

8. Check the grease in the lower unit of the outboards propeller once a week, and drain and replace the lower unit grease every three weeks. Jet units must be greased daily. This is crucial. Special grease guns will be provided.
9. If the skeg or jet unit hits bottom, check the screws for tightness and housing damage.
10. If your outboard will not start, check the following:
 - a. Check to see if the fuel line is connected to the motor and the tank and not pinched or kinked.
 - b. Check to see if there is water in the gasoline.
 - c. Check to see if the engine is flooded.
 - d. Check the spark plugs as they may be fouled or defective (replace if needed).
11. All outboards are to be tilted in the up position when moored stations to preclude silt accumulation in the jet unit or water pump and skeg or housing damage.

Boats

1. Boats are to be kept clean and free of loose tools and debris, and moored at locations where they are not subject to damage by wave action or through contact with the river bottom in rock laden areas.
2. Each crew leader will be responsible for maintaining mooring stakes on the river bank sufficient for the boats assigned to his subproject plus one transient craft. Further responsibility includes maintaining a bow line on each assigned craft and ensuring that each boat is properly moored at the end of each work day to preclude possible loss or damage.

Generators

Portable generators may be supplied to field camps. Their maintenance follows the same line as for the outboards. Since some of the generators have 4-cycle engines, mixed gas must not be used. The crankcase oil reservoir should be checked daily and maintained at the full level. After 25 hours of operation the oil should be changed. Spark plugs should be checked after every five (5) hours of operation.

Camp Maintenance

Maintaining a clean and efficient camp site is required. A few of the things to check are:

1. Maintenance of living accommodations and other installations will be performed as necessary. All materials necessary will be provided.
2. Grounds will be kept free of litter. All garbage will be bagged up and disposed of at the nearest sanitary landfill at least once a week. Special precautions should be observed to ensure that garbage does not attract bears and other scavenger species.
3. Upon completion of the summer season, all camp equipment will be cleaned preparatory to winter storage.
4. All sampling nets, tents, and tarps must be dry before being stored.
5. A complete camp inventory will be taken by the crew leader at the close of the field season.
6. All skiffs and ATV's will be chained and locked to a stationary object.

Camp Policy

1. No alcoholic beverages are to be stored in areas open to public view including cook tents. If alcohol is consumed at a camp an employee must be off-duty and under no circumstances shall he or she engage in the operation of any State equipment, including boats and motors nor shall he or she return to duty status under the influence of alcohol.
2. The crew leader of each camp shall establish a policy on living standards and personnel behavior in accordance with normal guidelines.
3. All sampling stations will operate as directed. Time-off for individual crew members shall be scheduled by the crew leader and shall have the option as to whether sampling duties allow time-off from the location.
4. All employees will be required to act in a professional manner at all times and shall be especially courteous to the public.
5. It will be the responsibility of the crew leader to prevent any abuse to State equipment.
6. Additionally, the crew leader must also report within 24 hours to the supervisor any damaged or lost equipment which may occur.

Food Orders

Grocery orders for Bear, Sandy, and Ilnik Rivers should be placed with Port Moller, Nelson River, Thinpoint and Middle Lagoon with Cold Bay, and Orzinski River with Sand Point during the evening radio schedule.

Personal Gear and Pets

Generally 100 lbs. is a maximum for personal gear. If you anticipate bringing more than that amount to your field camp, check with your supervisor first. Pets are allowed only on approval from the appropriate supervisor and other crew members and is usually not recommended. Past experience indicates, that one or more of the following problems may occur:

1. Problem of transportation in small planes for larger pets.
2. Who is going to pay for the pet food and who is going to purchase it in town?
3. Encounters with bears.
4. Your pet may not be compatible with the other members of your camp and may interfere with work, if this occurs the pet must be sent home.
5. A pet that gets sick or injured can cause you considerable expense if it must be flown to medical assistance.
6. Rabies is common on the Alaska Peninsula, be careful of all mammals including ground squirrels, fox, wolf, otters, and your pet. If bitten save the head of the animal if possible, wrap the head in several layers of plastic, put in a good box and freeze if possible. Notify your supervisor of the accident and your supervisor will send you into Anchorage if tests for rabies prove positive. Burn and bury remaining parts of the carcass away from water sources and cabins, take precautions such as wearing plastic gloves to dispose of the carcass. Do not send suspected rabies animals out of your area unless you are bitten, burn and bury the carcass as instructed.

Radio Schedules

Radio schedules will be made twice during every day. Radio schedules are normally at 8:45 a.m. and 7:30 p.m. on 3.230 megahertz unless otherwise specified. **The morning schedule is used for passing along the current weather (visibility, ceiling, precipitation, etc.) and the previous days escapement counts. The evening schedule is used for updated escapement counts, grocery and supply orders, and the latest pertinent fishery announcements.** All camps must complete the schedule within 15 minutes in the morning and 30 minutes in the evening, so we do not invade another areas time allotment. So, keep the conversation short. Personal conversation between camps should be arranged at times so not to interfere with any ADF&G schedules.

If a camp does not respond to two consecutive radio schedules, the worst will be assumed and a plane will be dispatched. If for some reason you know that you will not be able to make a schedule, notify beforehand either Cold Bay, Sand Point, or Port Moller. The Coast Guard can also be summoned using frequency 4.125 by saying "Mayday, Mayday, Mayday" and give your name, say who you work for, your location (field camp name on the Alaska Peninsula and approximate distance from a town, i.e. 10 miles east of Port Moller for Bear Lake), and the nature of the injury. Always broadcast even if you think nobody hears you. Somebody may be listening to the radio somewhere and can pass on your emergency to the appropriate people. All personnel need to be familiar with the single sideband and the appropriate dials to obtain the regular and emergency frequencies. If 4.125 is not marked on the radio and you need assistance finding which dial number it is located on, please ask the appropriate supervisor. Listed below is the latitude and longitude of some field camps. These lat./longs. should be written on the radio or be readily accessible in an emergency.

Nelson River ADF&G cabin	Lat. 55°48'73" Long. 160°59'29"
Sandy River ADF&G cabin	Lat. 56°12'02" Long. 160°01'55"
Wildman Lake Lodge which is located about 10 miles SW of the ADF&G cabin	Lat. 56°27'27" Long. 159°45'03"
Port Moller Airstrip	Lat. 56°00'44" Long. 160°33'43"

Fish and Wildlife Violations

This is not intended as an inclusive procedure for handling violations, it is not your job. Use this as a guideline for obtaining the necessary information and/or evidence to show and prove that a violation has been committed. It is important to be familiar with the commercial fishing, subsistence fishing, sport fishing, and hunting regulations in your area. Violation procedures are printed on the back cover of the commercial fishing regulation book. Request the regulation book if your camp does not have one.

The use of the 5 W's can greatly aid the Fish & Wildlife Protection officer in obtaining sufficient evidence for a case.

1. What is the violation?
2. When did the violation occur (date, time, tide condition, etc.)
3. Where did the violation occur?
4. Who is in violation and who are witnesses?
5. Why was the violation committed?

It is important that all witnesses to a violation be interviewed and all statements pertaining to a violation be recorded along with their names and addresses. If you have a camera available, pictures are extremely valuable in prosecuting offenders. Collect as much information as possible and contact your supervisor or a State Trooper from the Fish and Wildlife Protection Division immediately. If you do not feel comfortable, or your personal safety may be in danger, do not pursue the violation. Contact your supervisor and they will handle the violation. Be aware that you do not have the power to arrest somebody and never attempt this.

Firearms

A State weapon will be provided at each camp. If you are unfamiliar with the operation and use of a firearm, please let one of the field offices know. Training will be provided for anyone. Loaded guns are prohibited inside the camp facilities. Loaded, meaning a round in the chamber of the gun. Anyone handling a firearm should always treat it as if it were loaded. Guns should be kept clean and oiled and be completely unloaded while being cleaned. Any horseplay with or misuse of firearms while working for the Department of Fish and Game will not be tolerated and may be grounds for immediate dismissal. Completely unload a firearm of all rounds before entering a vessel or airplane. Keep an empty chamber under the firing pin of each pistol.

Bears

Do not encourage bears to come around camp by leaving food or unburned garbage around. Do not shoot at a bear unless, in your best judgment, he is endangering someone's life or damaging personal or state property. Use your best judgment on whether to shoot a bear if property is at stake. When, and if, trying to frighten a bear away by shooting - do not fire toward it. By chance, you may wound it by pulling the shot, ricochets, etc. If you are having problems with a particular bear around camp, call the office and notify them of the situation. The Game Division personnel will take care of the problem, if it is feasible.

Garbage

Burn all garbage to prevent bear problems. Flatten metal cans and box them for empty return flights. Garbage pits are prohibited by the Fish and Wildlife Service on a refuge. Be sure all burn barrels have proper grates or covers to prevent grass fires from sparks. Never leave a fire unattended and always have adequate extinguishing material handy.

Transportation

Do not endanger life or property by going out in a boat on dangerously rough water. If you are unfamiliar with Marine Safety, ask one of the field offices for information or advice. All personnel must wear a life jacket when out on open water. Use your head - if you think it is dangerous, don't go out on the water.

Extra shear pins or propellers and a tool kit which includes pliers, spark plugs, and a spark plug wrench should be in the boat at all times. In case travel at night becomes necessary, carry a flashlight.

Some camps may be furnished with 3-wheel or 4-wheel all terrain vehicles (ATV's). The following safety precautions shall be observed at all times regarding Department ATV's. Only employees of the State may use the vehicles. Non-Fish and Game employees are not allowed on these vehicles at any time. Only one employee may ride on the vehicle at one time. A safety helmet is provided. An ATV may provide transport of State materials, supplies, and equipment between camp sites and supply planes or vessels. In addition, they may be used for transportation to and from assigned duties in the field such as monitoring a fishery or collecting harvest information, etc.

Review the Marine Safety and Light Aircraft Safety Manuals located at all camps before boating or flying. Do not get in a boat or plane if you feel uncomfortable with the situation. Consult the crew leader or pilot beforehand.

Fire and First Aid

Check your camp's fire extinguisher. Know where it is and how to use it! Inventory your camp first aid kit, replace items as needed and become familiar with basic first aid treatment. Review the first aid booklet.

Take pains to avoid intestinal parasites carried by beavers. When in doubt, boil your drinking water for 15 minutes.

Keep the cabin, surrounding area, and yourself clean and neat. Appearance is important. You will not always be notified of the intended arrival of visitors, officials, etc. Impressions of visitors are often based on appearance.

Rabies is common on the Alaska Peninsula, be careful of all mammals including ground squirrels, fox, wolf, and otters. If bitten save the head of the animal if possible, wrap the head in several layers of plastic, put in a good box and freeze if possible. Notify your supervisor of the accident immediately. Burn and bury remaining parts of the carcass away from water sources and cabins, take precautions such as wearing plastic gloves to dispose of the carcass. Do not send suspected rabies animals out of your area unless you are bitten, burn and bury the carcass as instructed.

Compatibility of Field Personnel

If you find yourself unable to get along with other members at your camp, notify your supervisor and an attempt will be made to solve the problem. Usually, the person with the most experience in camp will be the crew leader. If it is not clear who has been designated crew leader in your camp ask your supervisor.

479

APPENDIX D

Guide to the Collection and Identification of Presmolt Pacific Salmon in Alaska with an Illustrated Key

A Guide to the Collection and Identification of Presmolt Pacific Salmon in Alaska with an Illustrated Key

MILTON B. TRAUTMAN¹

ABSTRACT

This field and laboratory key contains recommendations for types of equipment needed, instructions for preserving and labeling specimens, and descriptions of the characters used in identifying five species of Pacific salmon. The key is illustrated with six line figures: 1) juvenile salmon, 2) the first gill arch, 3) head with gill arch in situ, 4) first gill arch and eye for comparison with longest rakers, 5) method of counting anal fin rays, and 6) ventral surface of head showing branchiostegals. Five plates of stippled line drawings of five lengths (25 to 110 mm fork length) for each of the five species of Pacific salmon, an annotated opposable key, and a glossary are also included.

INTRODUCTION

As adults, the five species² of Pacific salmon of the genus *Oncorhynchus* inhabiting western North American waters are easily identified, but as subadults or as smolts in silvery coloration, they are less easily recognized. As juveniles less than 125 mm (5 inches) in fork length (FL), they may be quite difficult to identify. In addition, characters by which presmolt juveniles can be distinguished may vary with geographic area.

Several keys for identification of juvenile salmon have been published, most of which utilize the number, length, and shape of the gill rakers on the first gill arch; number of pyloric caeca and branchiostegals; and absence of parr marks, or if present, their size and shape (Foerster and Pritchard, 1935; Schultz, 1936; Haig-Brown, 1947; Clemens and Wilby, 1961; McPhail and Lindsey, 1970; Wilimovsky³). In addition to

the above characters, the key in this paper emphasizes and illustrates the distribution of those chromatophores (usually melanophores) which are reliable enough to aid in the specific identification of juveniles.

This key describes the characters typical of presmolt juveniles of the five species of Pacific salmon in Alaska. The common names recommended by the American Fisheries Society (Bailey et al., 1970, p. 17) are used, despite the fact that other names appear to be in more general use. These other names are inserted in parentheses after their respective species. Trouts, Atlantic salmon (*Salmo salar*), and some other salmonoids are included in the key because of their resemblance to Pacific salmon.

Before presenting the key, it appears advisable to describe the equipment and methods I recommend for preserving specimens, labeling specimens, and counting, measuring, and removing parts of specimens, so that those not acquainted with my procedures may more accurately and quickly identify their material.

¹ Professor Emeritus of Zoology, Ohio State University, Columbus, OH 43210. The author was employed in Alaska by the National Marine Fisheries Service Auke Bay Fisheries Laboratory during the summers of 1959 and 1961. The specimens were obtained and most of the drawings made at that time.

² A sixth species, *O. masoni* (Brewer), inhabits the streams of eastern Asia from the Okhotsk Sea to Formosa.

³ N. J. Wilimovsky, 1958. Provisional keys to the fishes of Alaska. On file Natl. Mar. Fish. Serv., Auke Bay Fish. Lab., Auke Bay, AK 99821.

RECOMMENDED EQUIPMENT

Magnifiers: Magnification in the range of 4 to 30 will prove helpful in identification of juvenile salmon. A binocular microscope having such a range is the most satisfactory, but any type of magnifier of more than 4 power and less than 30 may be used provided it is not necessary to use one's hand to hold it—usually both hands are needed to manipulate a specimen. In the field, a binocular unit containing lenses inserted in a frame or headstrap or a jeweler's eye magnifier (especially if one wears glasses) may be used.

Forceps: Four or five inches long with straight or curved tips—for lifting fins, holding back gill covers, etc.

Scalpel: A sharp blade an inch or two long—for removing gill arches, opening body cavities, etc.

Teasing needle: A needle inserted in a wooden or metal handle—for separating closely set gill rakers, etc.

Dividers: For measuring and comparing various body parts; dividers in which one or both legs can be "broken" are the most satisfactory.

Scissors: About 6 inches long with the blades or cutting surface of about 1 inch.

Ruler: Graduated in millimeters to measure fish lengths and parts; one which includes inches also desirable.

PRESERVING SPECIMENS

The careful preserving of specimens cannot be too strongly emphasized. Much time is lost in attempting to identify improperly preserved fishes; it is only when properly preserved that they may be rapidly and correctly identified. Frequently, juvenile salmon that have died in nets become soft, bleached, and torn. For the sake of accuracy it is better not to attempt to identify such material.

To preserve juveniles, upon capture place them in a solution of 1 part Formalin to 9 parts water. If live fishes are placed in too strong a Formalin solution, they may die with their mouths widely agape or the chromatophores may close so tightly as to be difficult to detect. If placed in too weak a Formalin solution, the fishes become bleached and soft and may decompose. If fishes are to be preserved for more than a year (or permanently),

leave them in the Formalin solution at least 1 wk and if possible no longer than 4 mo. When fish are removed from the Formalin solution, soak them in water for 24 to 48 hr; then place them in a solution containing 70% ethyl alcohol and 30% water or 35% isopropyl alcohol and 65% water.

Do not crowd or pack fishes in a container, especially if they are alive or only recently dead. Fresh fishes, if packed too tightly, will become permanently deformed upon hardening in Formalin, will be bleached where their bodies come in close contact, or will decompose. A container is too crowded if the fishes will not readily move as the container is slowly rotated or shaken. When sufficient room is allowed, identification will be facilitated because the fishes will harden without discoloring; bodies and fins will not be deformed, twisted, or broken; and the chromatophores will remain nearly or fully open.

LABELING SPECIMENS

Labeling specimens fully and properly is of great importance; unlabeled or mislabeled specimens are of little or no value. Put the label with the specimens at the time the fishes are preserved. Label paper should remain firm when wet and should not become pulpy. Write clearly with pencil or permanent ink, recording the following data.

Field Number

Use your own or a department number. A satisfactory method is to use the first initial of your surname or your full surname, the last two digits of the year, and your collection number. Thus, if Joe Brown in 1962 preserves his fifth collection, he writes B-62-5 or Brown-62-5; if for the Department of Salmon Investigations he writes, SI-62-5. When a departmental symbol is used, it often is desirable for the collector to add his initials or name to the label.

Name of Water Body and Locality

Use names on standard maps. Whenever possible, avoid temporary or local names, such as

Brown's fishing camp. An example of a brief but adequate recording is: Alaska, Naknek River System, Katmai National Monument, Brooks Lake.

Date

Include the month, day, and year and, if pertinent, the hour.

The following additional information may be needed at times.

Method of Capture

Describe type of gear and size if significant, i.e., seine (2 cm mesh), fry net (1 cm mesh), trawl (1 cm bag), etc.

Temperature

Measure temperature of air and/or water. If water is ice-covered, what percent?

Other Water Conditions

If a *stream*: estimate its average width and maximum depth; if tidal and brackish, to what

extent; degree of turbidity and source—glacial silt, plankton, etc.; degree of gradient—low, moderate, or high; percentage of stream in pools, with or without current; percentage of stream in riffles, whether flow is sluggish, moderate, or swift; dominant bottom types—sand, gravel, boulders, bedrock, muck, silt, etc.; aquatic vegetation—submerged, emergent, or both (name dominant species or genera if known). If a *lake or bay*: state whether fresh, brackish, or saline; if tidal, state to what extent; estimate size and possible depth; give degree of turbidity, type of bottom, and amount and kinds of aquatic vegetation.

Remarks

Describe anything that may aid in identification of the fishes, such as peculiar markings, habits, or habitats.

CHARACTERS USED IN IDENTIFYING SPECIES

A juvenile salmon is shown in Figure 1 to assist in recognizing and defining the characters and the counts and measurements used when keying out a specimen.

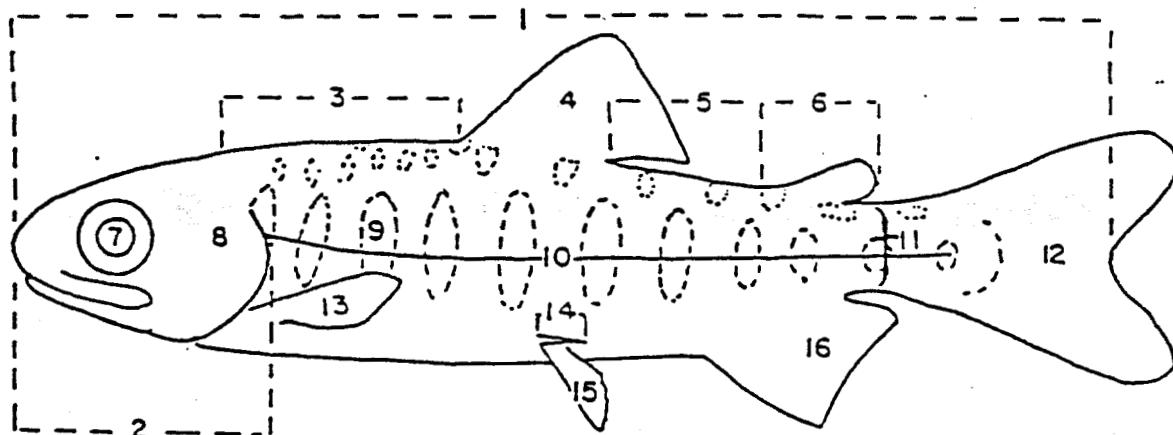
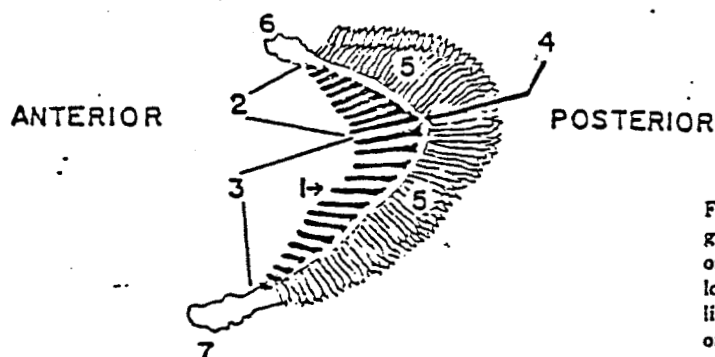


Figure 1.—Juvenile salmon, illustrating parts and methods of measuring: 1: fork length; 2: head length; 3: predorsal ridge; 4: dorsal fin; 5: portion of postdorsal ridge between posterior end of dorsal fin base and origin of adipose fin; 6: adipose fin; 7: pupil of eye; 8: gill cover, beneath which is gill chamber containing gill arches; 9: a pair mark; 10: lateral line; 11: caudal peduncle; 12: caudal fin or tail; 13: pectoral fin; 14: axillary process or scale; 15: pelvic fin; 16: anal fin.

First Gill Arch

Beneath each gill cover are four fully formed gill arches; the first gill arch on either side is the part used for specific identification. A gill arch (Fig. 2) consists primarily of a bony central arch to which the gill rakers are attached anteriorly, the gill filaments (lamellae) posteriorly. The gill rakers prevent solid substances such as food from being carried out through the branchial clefts and protect the delicate gill filaments. The numbers of gill rakers vary somewhat among individuals of each species of salmon, but the difference in average number between some species is sufficiently great to enable one to use them as specific characters.

The rakers on the gill arch may be counted as a unit, or the upper and lower limbs may be counted separately. The two limbs are joined



at an angle, the upper being the shorter. When a raker is situated astride the angle, it is included in the lower limb count. When all of the rakers on the arch are counted as a unit, a single number is given; otherwise, both limbs are recorded separately (the upper limb first), and then added, thus $12 + 20 = 32$.

The gill rakers nearest the angle of the arch are the longest; the rakers become progressively shorter as they approach the attachment ends of each arch. The rakers near the ends are often rudimentary and can be counted only under magnification.

It may be difficult to count all of the rakers accurately while the first gill arch is in place, in which case it will be necessary to remove the arch. To do this, turn back or cut away gill cover as shown in Figure 3. Lift the first gill arch up-

ward. With a sharp scalpel, cut between the dorsal ends of the first and second arches, making a deep incision parallel with them; then cut the remainder of the attachment away. Next cut the ventral attachment in the same manner; and when both ends are free, remove the arch. Great care must be taken so that all rudimentary rakers may be removed and counted. After finishing the examination of the arch, reinsert it in the gill chamber for possible future examination.

Gill Raker and Eye Comparison

The longest rakers are compared with the length of the eye (Fig. 4). With dividers, obtain the measurement of the length of the longest raker; then place one point of the dividers at the anterior edge of the eye, the other extending

Figure 2.—First gill arch of salmon after removal from left gill chamber: 1) gill raker; 2) gill rakers attached to upper or shorter limb of arch; 3) gill rakers attached to lower or longer limb of arch; 4) angle of arch (junction of the two limbs or bones); 5) gill filaments (lamellae); 6) upper point of arch attachment; 7) lower point of arch attachment.

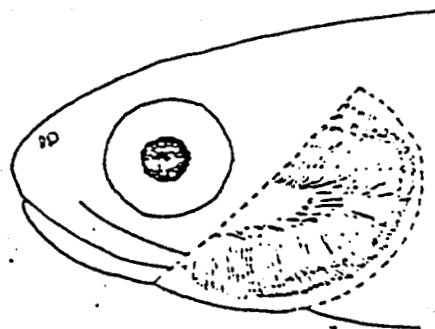


Figure 3.—Head of salmon. Dotted lines indicate that portion of gill cover which has been removed to show first gill arch in place.

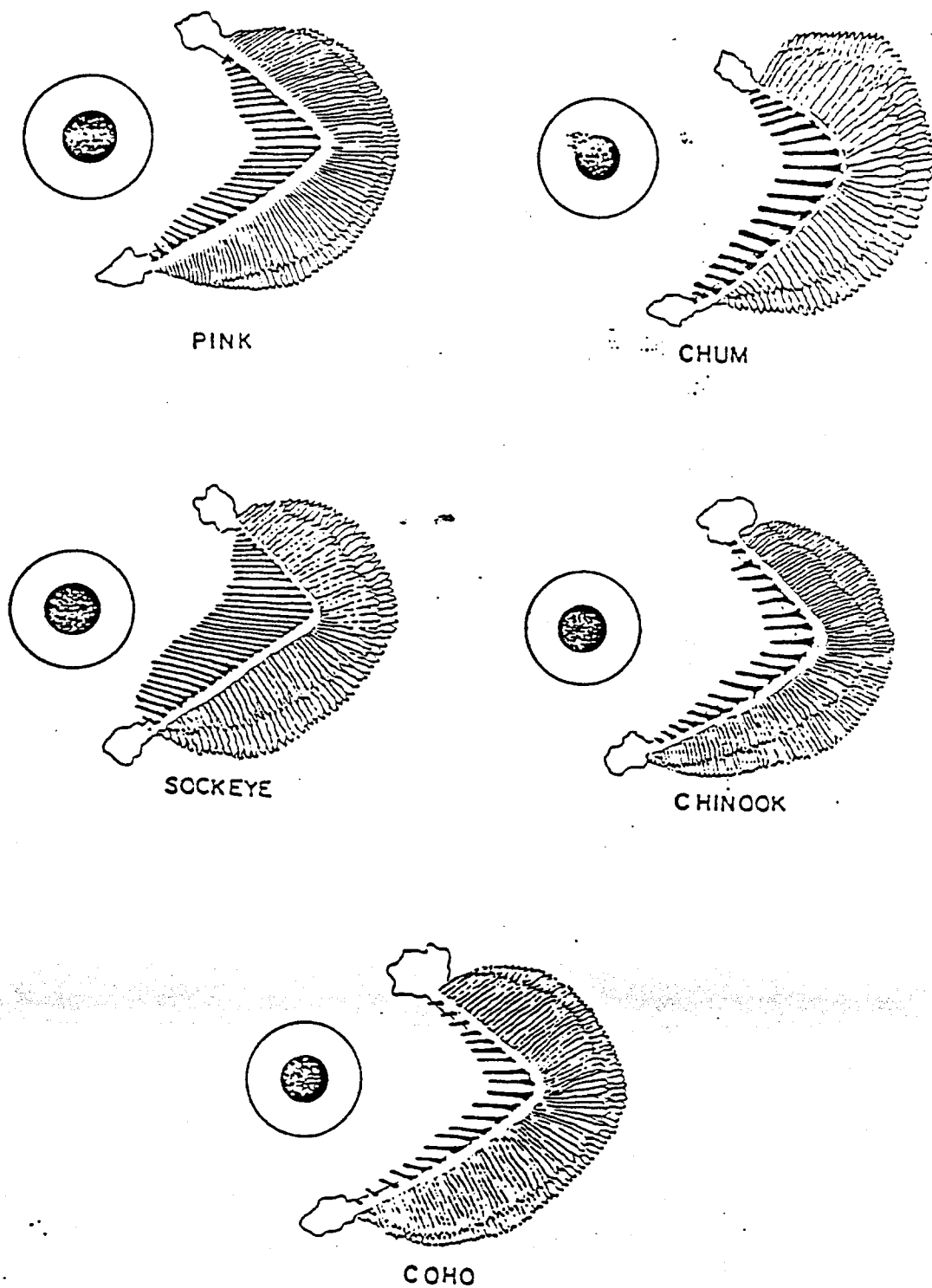


Figure 4. — First gill arch and eye for comparison with longest gill raker length of five species of Pacific salmon.

toward the opposite edge. Because the raker is shorter than the eye length in juvenile salmon, it is simplest to note where the raker reaches in relation to the pupil. Like many body part ratios, the gill raker-eye size ratios change as the juvenile salmon increases in length. For example, in specimens about 40 mm FL, the longest raker may be contained about 3 times the eye length, but in 140 mm specimens of the same species, the raker may be contained only about 2 times. This and other proportional changes must be considered.

Anal Fin Measurement and Count

To compare the length of the fin base with the longest ray, measure the anal fin base with dividers; then project the posterior leg of the dividers forward to the opposite tip of the longest ray as shown in Figure 5 by dotted line.

In counting the number of rays (Fig. 5), do not count those anteriormost ones which are less than half the length of the longest rays, such as those marked "0." Count all rays, such as No. 1, that are half (or more than half) the length of the longest ray, taking great care to observe the last ray—No. 15 in Figure 5. The last ray is usually split to its base and appears superficially as two rays, but it is in reality only one and should be counted as such.

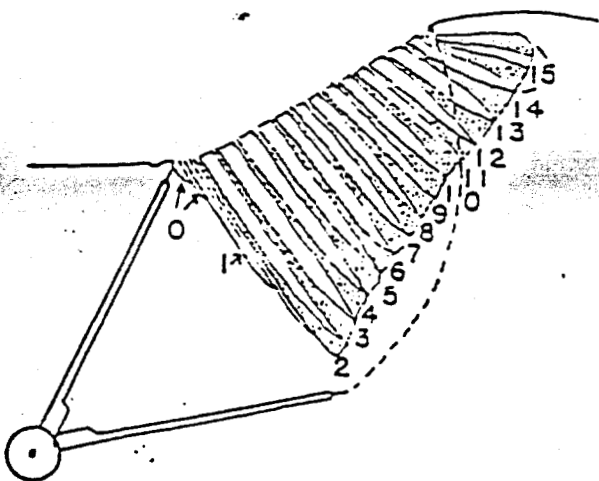


Figure 5.—Anal fin of salmon, illustrating method of measuring length of fin base and of counting rays (rays 2 to 15 are stippled here for emphasis).

Branchiostegal Count

All branchiostegals (Fig. 6), including the smallest, anteriormost ones are counted. Usually this may be accomplished satisfactorily only under magnification, and with juveniles longer than 40 mm FL. The branchiostegal count is used primarily as an additional character in specimens otherwise difficult to identify, and is especially valuable in separating the chinook salmon (usually 15 or 16) from the coho salmon (usually 13 or 14).

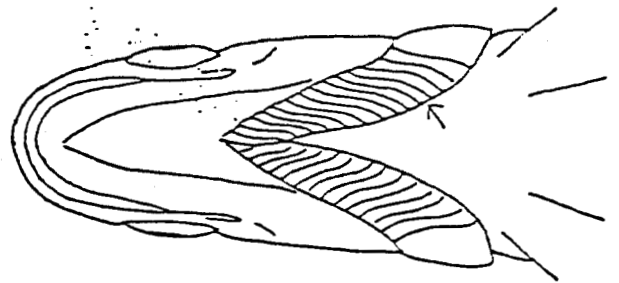


Figure 6.—Ventral surface of head of salmon. Arrow points to one of 14 branchiostegals on left side of head.

Pyloric Caeca Count⁴

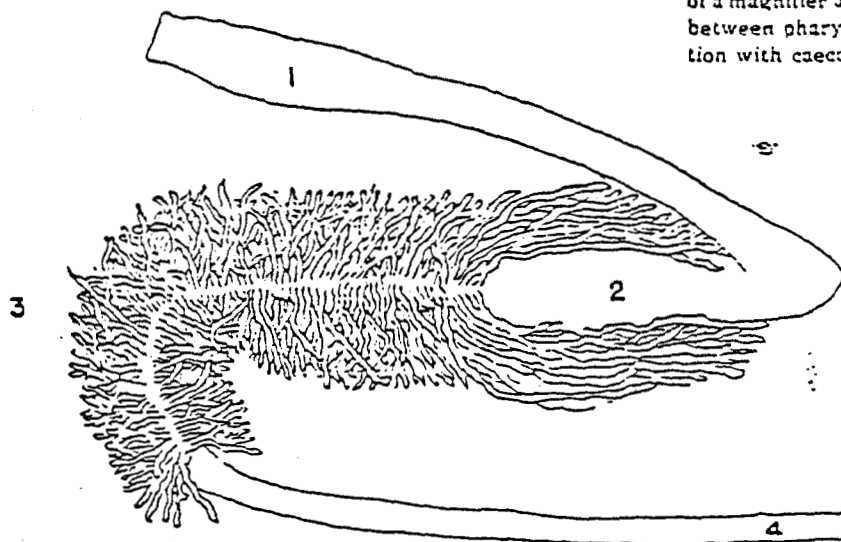
With a scalpel, widely open the abdominal cavity. Sever the esophagus as far forward as possible; then cut off the intestine near the posterior end of the stomach. The stomach and caeca can now be removed as a unit (Fig. 7). Use magnification and teasing needle as aids in counting. Counts of pyloric caeca are useful chiefly as an additional character for questionable specimens, especially in separating the chinook salmon (more than 100 caeca) from the coho salmon (fewer than 90).

Color Pattern Variations

Juvenile salmon from certain waters or at certain stages of development may have their parr marks or other markings masked by a bluish-

⁴In the key, I have used pyloric caeca counts of my own, plus published accounts of others and especially the more recent ones, such as Clemens and Wilby (1961) and McPhail and Lindsey (1970).

Figure 7. — Major portion of alimentary tract of salmon with pyloric caeca spread apart preparatory to counting with aid of a magnifier and teasing needle: 1) esophagus (part of tract between pharynx and stomach), 2) stomach, 3) pyloric section with caeca, 4) intestine.



or greenish-silvery sheen, especially when they are alive. To identify these fish, it may be necessary to preserve them first in Formalin to intensify their markings.

Juveniles of one species from certain waters, such as habitually turbid ones, may have their melanophores restricted in size or distribution, thereby resembling superficially another species. As an example, coho salmon normally have the adipose and anal fins densely speckled with rather large melanophores. But in some specimens, the melanophores may be reduced in size or distribution, so that coho salmon superficially resemble chinook salmon. Conversely, juvenile chinook salmon may have the melanophores unusually numerous and well developed, thereby resembling coho salmon. To avoid error in identification, compare the size and number of melanophores on the fins with those on the body; if few and small on the body, they should be few and small on the fins.

Color variations also occur regionally. An example is the predorsal stripe in chinook salmon, which in fish from some waters is normally a solid dark bar in specimens less than 80 mm FL; in chinook salmon in other waters the stripe may be reduced to a series of oblong blotches.

The length when individuals attain smolt coloration varies greatly, both regionally and in specimens from the same locality; some fish of

the same species may lose parr and other presmolt markings when only half as large as other fish.

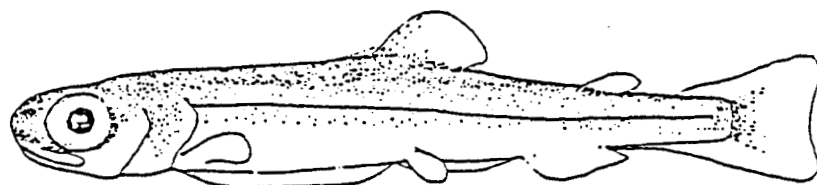
HOW TO USE KEY

Because of the variations in morphology and coloring, it is advisable to use the key in conjunction with the figures and plates and to check a large combination of characters.

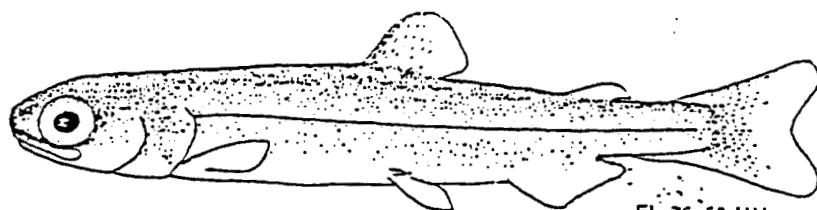
In using the key, first make certain your specimen is a Pacific salmon by examining the characters under the two opposable groups labeled "1." Next, note the absence or presence of parr marks (see sections "Combination of" under opposable groups 2). If no parr marks are present and your specimen has not entered the silvery smolt stage, it is probably a pink salmon, but to make sure, compare it with the identifying characters between opposable groups 2. If parr marks are present, note the absence or presence of melanophores on adipose and anal fins (see groups 3). If melanophores are absent, see sections "Combination of" under groups 4; if present, see "Combination of" sections under groups 5. Decide which "Combination of" most closely fits your specimen, then verify it by comparing the descriptions of the identifying characters for the opposable groups.

KEY TO PRESMOLT JUVENILE SALMON

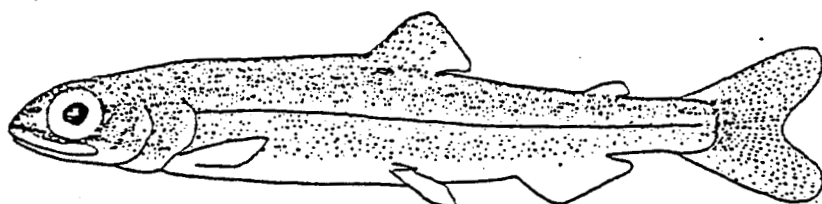
- Salmonoid fishes having fewer than 20 rays in the dorsal fin (excludes grayling); strong teeth on jaws and tongue (excludes ciscoes and whitefishes); many pyloric caeca (excludes smelts, family Osmeridae); an axillary process or scaly appendage above pelvic fin (Fig. 1, No. 14); an adipose fin; cycloid scales; upper jaw formed by both premaxillary and maxillary1.
- 1a Base of anal fin *shorter* than longest ray (Fig. 5). Anal rays usually 9 to 12 (rarely 8 or 13). Gill rakers normally fewer than 20 on first gill arch (Fig. 3). Dorsal fin of larger juveniles of some species with several blackish spots.
 CHAR. TROUTS, ATLANTIC SALMON.Not in this key.
- 1b Base of anal fin *longer* than longest ray (Fig. 5). Anal rays usually 13 to 17 (rarely 12, 18, or 19). Gill rakers normally 20 to 40 on first gill arch (rarely 19). Dorsal fin of larger juveniles lack blackish spots but tip of fin may be blackish.
 PACIFIC SALMON—genus *Oncorhynchus*.2.
- 2a *Combination of:* No parr marks on sides and no prominent specklings on back of presmolt juveniles. Usually no melanophores on anal and adipose fins; if melanophores present, they are few and very small, and if on adipose, are restricted to its posterior, free edge.
 PINK (HUMPBACK) SALMON—*O. gorbuscha*.Plate 1.
- General development—Similar to chum salmon in that yolk sac may not disappear until juvenile is more than 34 mm FL, after which development toward smolt shape and coloration is rapid. When less than 50 mm FL, this species is similar to chum salmon in being more terete than the sockeye, chinook, and coho salmon; body depth immediately before dorsal fin usually more than 1.5 times head length.
- Parr marks—Only species of salmon lacking parr marks in the presmolt juvenile.
- Coloration of body—*Preserved material*—In juveniles less than 40 mm FL, back is dark to lateral line and ventral half of body light when bicolored; dorsal third of body is darkest, sides lighter, ventral third lightest (usually milky-white or silvery) when tricolored. Few or no melanophores on lower sides and belly. In juveniles more than 40 mm FL, bicolored or tricolored condition is normally not evident, the dark back lightening gradually downward to the very light belly. *Living specimens*—Dorsal half of body bright bluish or greenish with much silvery reflection; ventral half milky or silvery-white.
- Fins—Anal and dorsal fins averaging smaller than in chum salmon; these fins in this species and in chum salmon distinctly smaller than in sockeye, chinook, or coho salmon. In specimens less than 40 mm FL the longest anal ray, when measured into head length, extends from tip of snout to about center of eye; in larger presmolt juveniles, this measurement extends from tip of snout to anterior half of eye. Anal rays usually 14 to 16 (extremes 13 to 17). *Dorsal fin* has few specklings and only a slight tendency toward a dark anterior edge in juveniles less than 30 mm FL; over 30 mm, blackish anterior edge becomes pronounced and tip of fin dusky. *Caudal fin* has speckling confined to basal half in juveniles less than 50 mm; with increasing length of juveniles, specklings appear along rays, and in large presmolt juveniles lobes tend to become blackish.



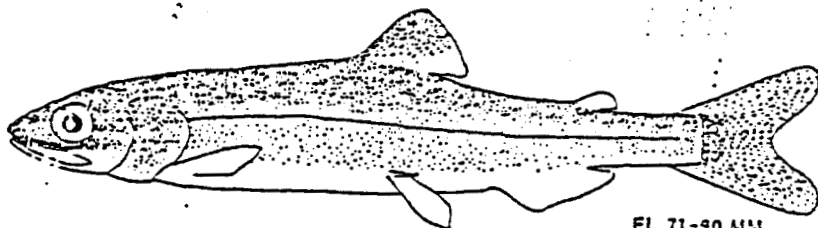
FL 25-35 MM



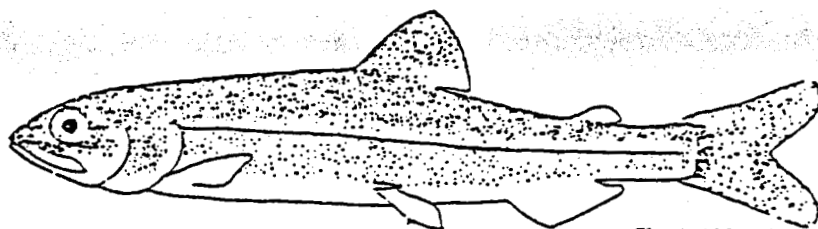
FL 36-50 MM



FL 51-70 MM



FL 71-90 MM



FL 91-110 MM

Plate 1.—Pink salmon.

- Gill rakers (see Fig. 4) — Eleven to fourteen on upper limb, 14 to 19 on lower, total usually ranging between 27 and 33 (extremes 25 and 35); rakers slender and rather long; most similar in size and number to sockeye salmon but shorter and usually fewer (normally less than 31).
- Pyloric caeca — Usually 130 to 195 (extremes 95 to 224); slender and rather long; differ sufficiently in numbers from coho and sockeye salmon, which have fewer than 100, to be a distinct aid in specific identification.
- Branchiostegal rays — Usually 11 to 14 (rarely 10 or 15); average number less than in other species, almost invariably less than in chinook salmon, which usually has 15 to 18 (rarely 14).
- Scales in lateral line — More than 170, more than in any other of the Pacific salmon; lateral line scale counts may be obtained under magnification in specimens longer than 60 mm FL.
- Habits — Shortest life span of any species, between 18 mo and 2 yr. Only a comparatively small proportion of adults make extended migration in fresh water. Majority spawn in fresh waters within a short distance of brackish water or in intertidal waters. Many young enter brackish or salt waters within a few hours or days after emerging from redds, and comparatively few are found in fresh water when more than 45 mm FL.
- Combination of:* Both parr marks on sides and dark spottings on back usually obvious in living, presmolt juveniles and always in preserved specimens under magnification (may be faint in fishes from turbid waters); parr marks become faint and disappear as juvenile assumes smolt coloration 3.
- 2b
- No melanophores normally present on adipose and anal fins of presmolt juveniles, or if present, few and quite small. Parr marks occupy a larger area above lateral line than below it, and in some specimens anterior parr marks may be almost entirely above the lateral line.
- 3a
- CHUM AND SOCKEYE SALMON 4.
- Melanophores normally obvious on adipose fin in living specimens and always in preserved specimens under magnification (may be indistinct in juveniles from silty waters). Anteriormost parr marks appear to occupy as large (or almost as large) an area below lateral line as above it; these parr marks are usually large, long, and wide.
- 3b
- CHINOOK AND COHO SALMON 5.
- Combination of:* Gill rakers 19 to 26 (average 23), notably fewer and much shorter than in sockeye salmon, which have more than 28. Normally no melanophores on adipose and anal fins. Anterior squarish (quadrate) parr marks situated almost or entirely above lateral line in specimens less than 50 mm FL; in presmolt juveniles more than 50 mm FL, anterior parr marks tend to be long and very narrow and sometimes may extend well below lateral line.
- 4a
- CHUM (DOG) SALMON — *O. keta* Plate 2.
- General development — Similar to pink salmon in that yolk sac may not disappear until juvenile is more than 34 mm FL, after which development toward smolt shape is rapid. Also similar to pink salmon in being more terete (when less than 50 mm FL) than the sockeye, chinook, and coho salmon; body depth immediately before dorsal fin usually 1.5 to 1.8 times head length.

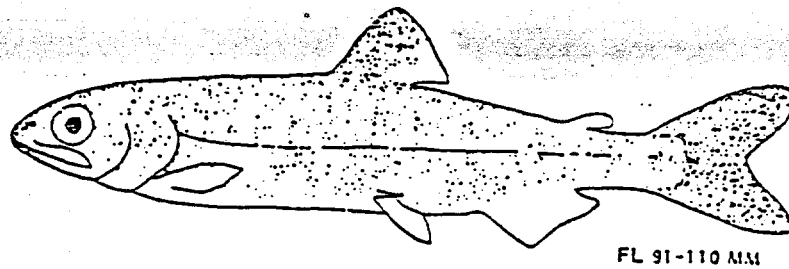
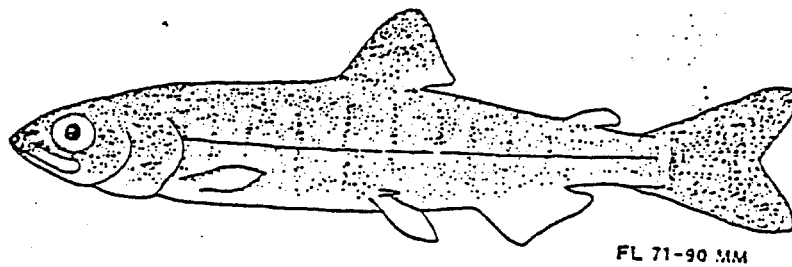
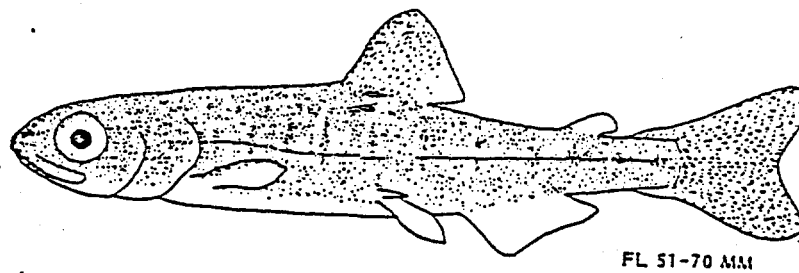
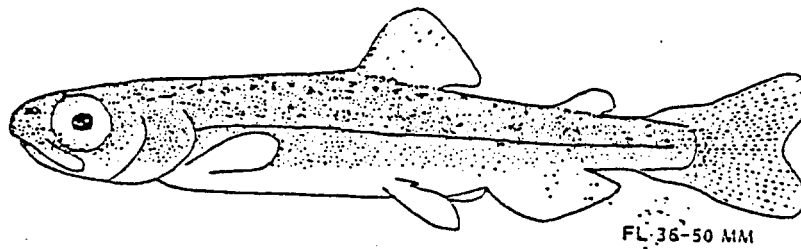
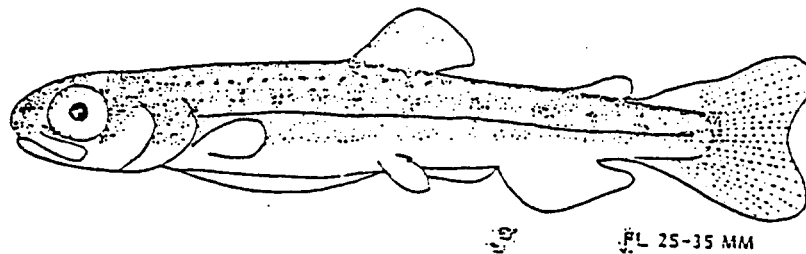


Plate 2. — Chum salmon.

Parr marks—Anterior parr marks in specimens less than 50 mm FL are more squarish (quadrate) and do not extend quite so far below lateral line as in sockeye salmon; in presmolt juveniles more than 50 mm FL, parr marks tend to become longer and more narrow than in sockeye salmon, and some tend to extend well below lateral line.

Coloration of body—*Preserved material*—Dorsal ridge stripe usually present, sometimes a series of blotches in juveniles less than 50 mm FL, becoming faint or disappearing in presmolt juveniles more than 50 mm FL; a prominent irregular row of spots and blotchings between dorsal ridge and upper edge of parr marks, these usually most distinct in specimens between 34 and 50 mm, often fading or disappearing in larger juveniles. *Living specimens*—Markings may be obscured by greenish or bluish overcast of dorsal half of body and whitish or silverish sheen of ventral half.

Fins—Anal and dorsal fins small, averaging slightly larger in size than those of pink salmon and averaging considerably smaller in height and area than those of sockeye salmon. Length of longest anal ray, when measured from snout to eye, reaches to, or almost to, center of eye; in sockeye salmon this measurement usually extends well beyond center of eye. Anal rays usually 13 or 14 (extremes 13 to 17). *Dorsal fin* has few or no distinct spottings in specimens less than 50 mm FL; in larger presmolt juveniles a dusky spot develops on tip. *Caudal fin* has faint spots largely confined to basal half in juveniles less than 50 mm FL; in larger juveniles lobes become blackish.

Gill rakers (see Fig. 4)—Seven to twelve on upper limb, 12 to 19 on lower, total usually ranging between 20 and 26 (extremes 19 to 30); rakers blunt and short, in sharp contrast to thinner, longer, and more numerous rakers of sockeye salmon, which has 30 to 39.

Pyloric caeca—Usually 160 to 185 (extremes 140 to 249); differ sufficiently in numbers from sockeye and coho salmon, which usually have fewer than 100, to be an aid in specific identification.

Branchiostegal rays—Usually 13 or 14 (extremes 12 to 16); of value primarily in separating this species from chinook salmon, which generally has more than 15.

Scales in lateral line—Between 125 and 155; of value chiefly in separating this species from pink salmon.

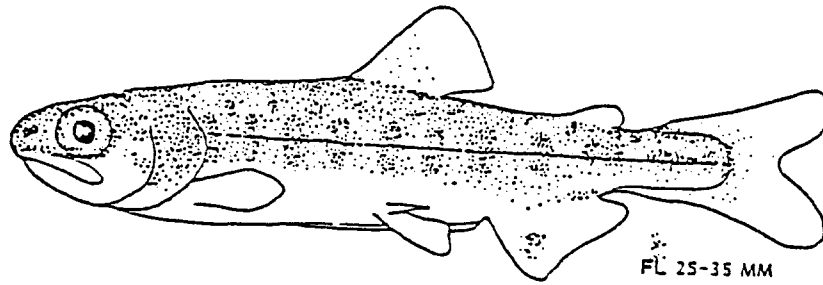
Habits—Life span usually 3 to 5 yr, for majority, 4 yr, some less than 3 yr. Jacks may occur. Majority spawn in fresh waters only a comparatively short distance from brackish water or in intertidal waters. Many young enter brackish or salt waters very shortly after emerging from redd, and few juveniles are found in fresh waters when more than 45 mm FL.

4b *Combination of*: Gill rakers 30 to 39 (average 36); notably more numerous, longer, and more slender than in chum salmon, which have fewer than 27. Normally no melanophores on adipose and anal fins. Anterior parr marks more rectangular than squarish in outline in specimens less than 45 mm FL and sometimes extend as much as a third to a half below lateral line; these oblong parr marks tend to shorten in presmolt juveniles more than 50 mm FL and to be mostly above lateral line.

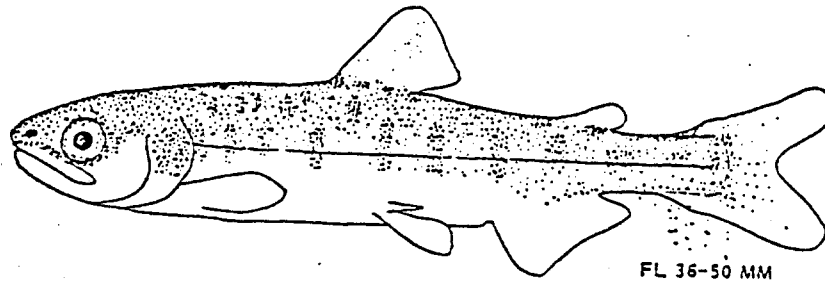
SOCKEYE (RED) SALMON—*O. nerka*. Plate 3.

General development—Yolk sac usually disappears, except for trace, before juveniles reach 30 mm FL. Body deeper and species more slab-sided in all presmolt lengths than in chum and pink salmon—body depth immediately before dorsal fin usually less than 1.5 times head length.

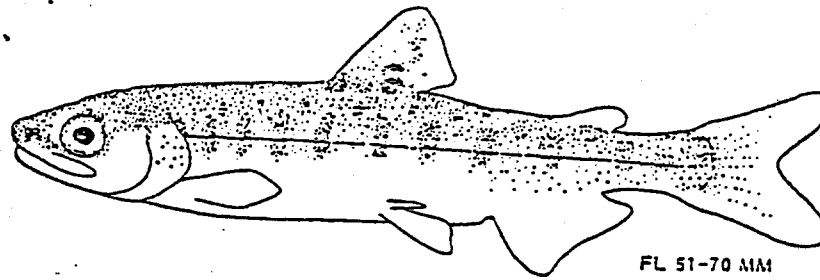
Parr marks—See "Combination of" above.



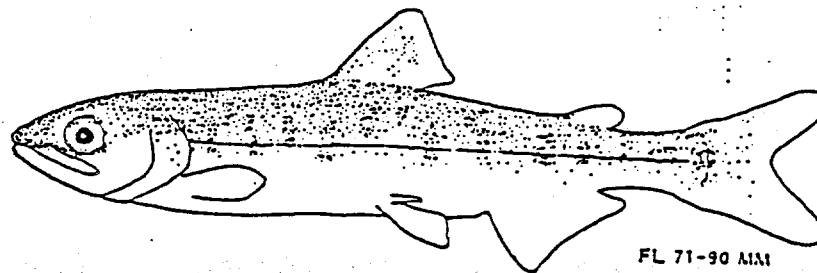
FL 25-35 MM



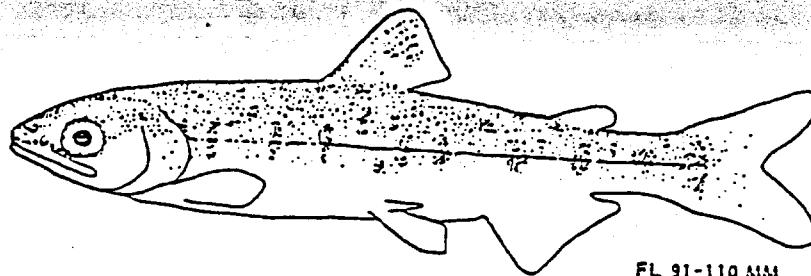
FL 36-50 MM



FL 51-70 MM



FL 71-90 MM



FL 91-110 MM

Plate 3.—Sockeye salmon.

Coloration of body—*Preserved material*—Dorsal ridge usually contains a series of more or less distinct spots in specimens less than 35 mm FL, becoming more confluent in fishes between 40 and 55 mm FL and sometimes merging into a dusky bar; in presmolt juveniles over 60 mm FL, spots or bars may disappear after which a series of roundish spots become apparent on both sides of, and adjacent to, dorsal ridge, especially that portion behind dorsal fin; in addition to these spots, in fishes more than 35 mm FL, another longitudinal row of spots develops between dorsal ridge and upper halves of parr marks. *Living specimens*—Markings may be obscured by greenish or bluish overcast of dorsal half of body and whitish or silverish sheen of ventral half.

Fins—Anal and dorsal fins average larger in height and area than in chum and pink salmon. Length of longest anal ray, when measured from snout to eye, reaches usually from snout to beyond center of eye. Anal rays usually 14 to 16 (extremes 13 to 16). *Dorsal fin* normally has few or no distinct specklings in specimens less than 60 mm FL; a rather faint dorsal spot develops in larger presmolt juveniles in upper portion of fin, the fin being bordered on its free edges with whitish (see lowest figure, Plate 3). *Caudal fin* has few specklings on basal half, the lobes having few or no melanophores, even in rather large juveniles.

Gill rakers (see Fig. 4)—Twelve to sixteen on upper limb, 18 to 23 on lower, total usually ranging between 32 and 37 (extremes 30 to 39); rakers long and slender, averaging longer than in any other species, in sharp contrast to fewer, blunter rakers of chum salmon, which has 19 to 30.

Pyloric caeca—Usually 65 to 95 (extremes 45 to 115); usually considerably fewer than in pink, chum, and chinook salmon, and averaging more than in coho salmon.

Branchiostegal rays—Usually 13 to 15 (extremes 11 to 16); of value chiefly in separating this species from chinook salmon, which average more.

Scales in lateral line—Between 125 and 140; of value chiefly in separating this species from pink salmon, which has a higher number.

Habits—Life span usually 4 or 5 yr, some only 3. Jacks may occur. Majority of individuals highly migratory. Adults usually spawn in streams tributary to lakes; a small minority spawn in streams without a lake, in lake outlets, or on lake beaches. After rising from redd, young move downstream rather rapidly to a lake, remaining usually 1, sometimes 2, and rarely 3 yr in fresh water before entering brackish or salt water.

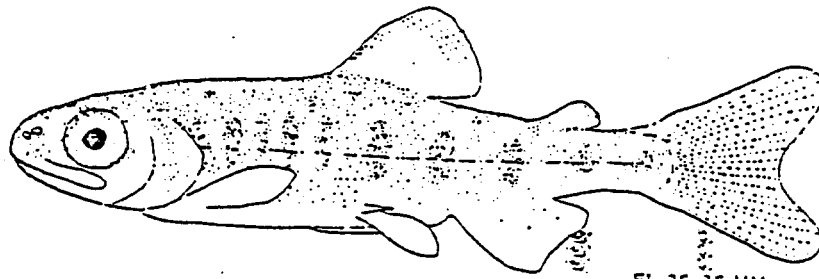
5a

Combination of: Melanophores on adipose fin usually most numerous on posterior half and generally forming a dark border (see Plate 4); anterior half of adipose with few melanophores or none. Anal fin with few melanophores or none, but when melanophores are present, often quite large. Tip of dorsal fin and lobes of caudal fin darker in larger presmolt juveniles.

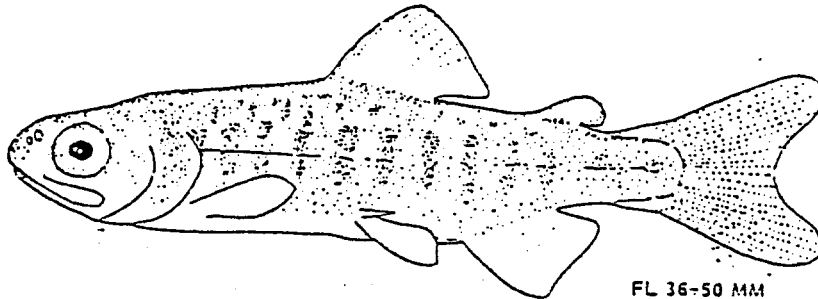
CHINOOK (KING) SALMON—*O. tshawytscha*. Plate 4.

General development—Yolk sac usually disappears or is reduced to a trace before juveniles reach 32 mm FL. Body deeper and species more slab-sided in all presmolt lengths than in chum and pink salmon; body depth immediately before dorsal fin usually less than 1.5 times head length (range 1.1 to 1.5).

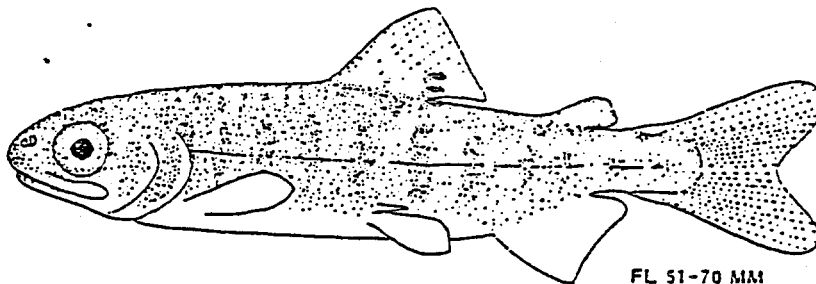
Parr marks—Almost invariably rectangular and long vertically; marks usually situated equidistant on each side of lateral line; dark parr marks and other markings contrast sharply with lighter background of body in some living and most preserved specimens.



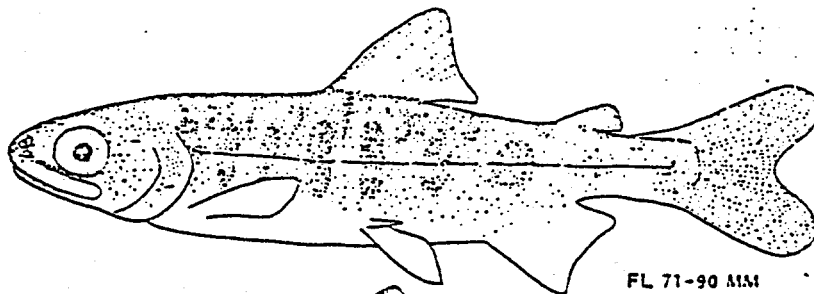
FL 25-35 MM



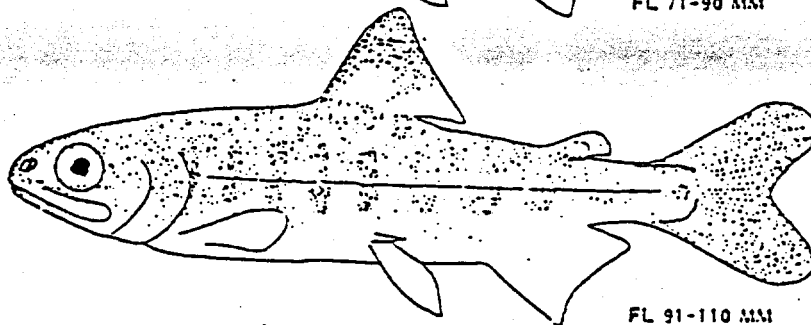
FL 36-50 MM



FL 51-70 MM



FL 71-90 MM



FL 91-110 MM

Plate 4.—Chinook salmon.

Coloration of body—*Preserved material*—Background color of body generally much lighter than body color of coho salmon, usually contrasting sharply with dark dorsal stripe or spotting, parr marks, and prominent dorsal spottings: blackish band astride dorsal ridge usually bold and unbroken in specimens less than 80 mm FL and especially on ridge before dorsal fin; in larger juveniles dorsal band often breaks up into series of spots, disappearing in larger pre-smolts as other spottings on dorsal half of body become more numerous and distinct; spottings between dorsal ridge and parr marks absent in fishes less than 35 mm FL, developing rapidly thereafter into many large and small spots and increasing in numbers as juveniles approach smolt stage. *Living specimens*—Parr marks and other markings may be obscured by bluish-silvery color of dorsal half of body and silvery sheen of ventral half.

Fins—Anal and dorsal fins averaging considerably larger in area than those of the chum and pink salmon and slightly larger than in the sockeye salmon; length of longest anal rays, when measured into head length, reaching from snout tip to beyond posterior edge of pupil and sometimes beyond posterior edge of eye; distal edge of anal slightly falcate in specimens more than 40 mm FL but averaging less falcate than does the free edge of the anal of the coho salmon. Anal rays 15 to 19, averaging higher in number than in any other species. *Dorsal fin* in young less than 60 mm FL usually has few or no distinct spottings, a blackish spot developing in the upper portion of the fin as the juveniles approach the smolt stage (see Plate 4). *Caudal fin* has comparatively few melanophores rather generally distributed in the smaller individuals, the lobes darkening as the fishes approach the presmolt stage.

Gill rakers (see Fig. 4)—Seven to twelve on upper limb, 10 to 16 on lower, total usually ranging between 20 and 25 (extremes 19 to 28); rakers short and similar in size and number to chum and coho salmon.

Pyloric caeca—Usually 140 to 185 (extremes 90 to 240); of value in separating this species from coho salmon, which normally has fewer than 85.

Branchiostegal rays—Usually 16 to 18 (extremes 13 to 19); average number greater than in any other species.

Scales in lateral line—Between 122 and 152; usually of most value in separating this species from pink salmon.

Habits—Life span 2 to 8 yr, usually 4 to 6. Jacks may occur. A portion of the juveniles enter salt water during first year of life; remainder stay in fresh waters more than 1 yr but rarely 2 yr. Juveniles of presmolt stage found in fresh waters when as long as 150 mm FL.

Combination of: Melanophores usually numerous and rather evenly distributed on adipose fin; occasionally in larger juveniles, posterior or free edge may be darker than remainder, thereby resembling somewhat melanophore distribution on adipose of chinook salmon. Anal fin in specimens larger than 30 mm FL more falcate and anterior tip more pronounced than in other species, including chinook salmon; in all except smallest specimens, anterior or leading edge of anal fin is whitish, with a dark bar parallel and posterior to it; remaining, posterior portion of fin usually abundantly speckled with melanophores except for distal and posterior edges (see Plate 5).

COHO (SILVER) SALMON—*O. kisutch*. Plate 5.

General development—Yolk sac usually disappears, except for a trace, before juveniles reach 32 mm FL. Body deeper and species more slab-sided in all pre-

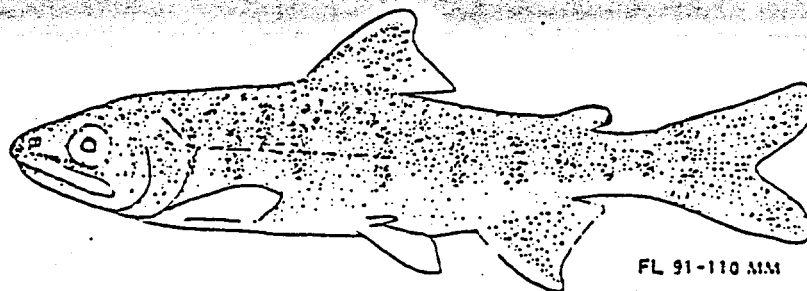
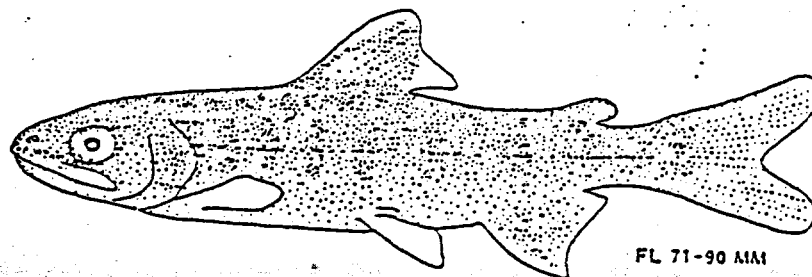
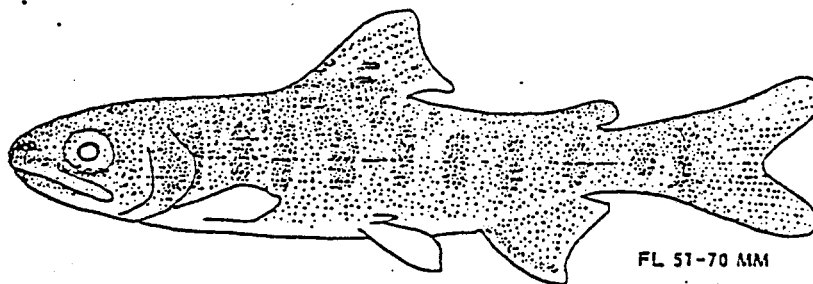
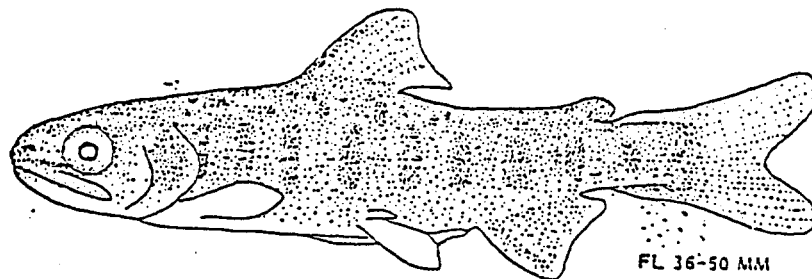
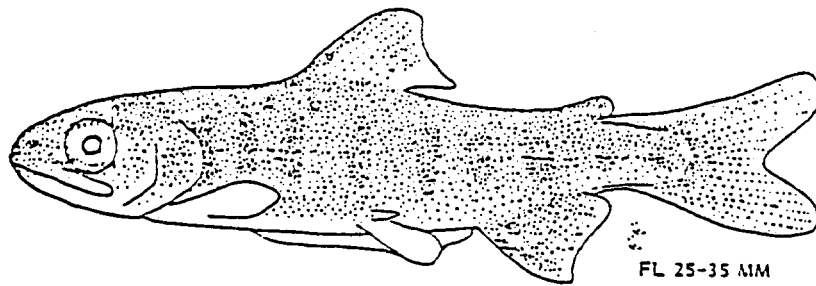


Plate 3. — Coho salmon.

smolt lengths than in chum and pink salmon; body depth immediately before dorsal fin usually less than 1.5 times head length (range 0.9 to 1.5).

Parr marks—Anterior parr marks always large and long vertically, their upper and lower ends more rounded than rectangular-shaped parr marks of chinook salmon; marks usually situated equidistant on each side of lateral line; usually less contrast between color of parr marks and body than in chinook salmon.

Coloration of body—*Preserved material*—In all but smallest specimens, contrast between all body marks and background color of body is not as pronounced as in other species; dark bar along dorsal ridge usually distinct and unbroken in juveniles less than 50 mm FL, breaking up into spots or disappearing in larger specimens; back spottings on both sides of dorsal ridge usually prominent in all except smallest specimens; spots between parr marks often elongate and extending downward between them, sometimes to lateral line (see bottom figure, Plate 5); spots on dorsal half of body often increase in number and/or decrease in size as individuals approach smolt stage. *Living specimens*—Parr marks and other body markings may be obscured by dark coloration of body or by bluish sheen.

Fins—Anal and adipose fins described under "*Combination of*" (this section). Anal rays usually 13 or 14 (extremes 13 to 16). *Dorsal fin* has comparatively few melanophores scattered over it in smallest specimens; in those more than 32 mm FL the number of melanophores increases, especially on or adjacent to anterior or leading edge; this results in a dark bar along the anterior edge behind which melanophores are rather evenly distributed; as fishes approach presmolt stage, a white anterior (or leading) edge and a whitish tip develops, followed by a dark parallel bar (see bottom figure, Plate 5). *Caudal fin* has rather even distribution of melanophores along rays in all except smallest young, this increasing in color intensity and number as fish increases in size.

Gill rakers (see Fig. 4)—Eight to thirteen on upper limb, 9 to 14 on lower, total number usually ranging between 19 and 27 (extremes 18 to 27); rakers short and rather similar in size and number to chum and chinook salmon.

Pyloric caeca—Usually 50 to 85 (extremes 45 to 114); of value in separating this species from chinook, pink, and chum salmon, which normally have more than 100.

Branchiostegal rays—Usually 13 or 14 (extremes 12 to 15); average number less than in chinook salmon, which normally has 15 or more.

Scales in lateral line—Between 120 and 140 (average 128); usually averaging fewer than in any other species.

Habits—Life span 2 to 4 yr. Jacks may occur. Majority appear to spend 1 or 2 yr in fresh waters, a few 3 yr. Some juveniles in presmolt stage are found in fresh waters when 150 mm FL.

GLOSSARY

- Adipose fin** A fleshy, finlike, rayless structure situated on dorsal ridge between dorsal and caudal fins (Fig. 1, No. 6).
- Anal fin** The fin situated medially and immediately behind vent between posterior end of abdomen and anterior end of caudal peduncle (Fig. 1, No. 16).
- Axillary process or scale** An accessory enlarged scale attached to upper or anterior base of pelvic fin (Fig. 1, No. 14).
- Gill opening** Opening between opercle or gill cover and side of head.
- Branchiostegals or branchiostegal rays** Elongated bones arranged fanwise within branchiostegal membranes, situated on ventral edge of gill covers (Fig. 6).
- Caudal fin** Terminal or tail fin of fishes (Fig. 1, No. 12).
- Caudal peduncle** That region of body between base of posterior ray of anal fin and base of caudal fin (Fig. 1, No. 11).
- Chromatophores** Color cells which under control of sympathetic nervous system can be altered in shape, producing color changes.
- Cycloid scales** Smooth-edged scales of soft-rayed fishes having an evenly curved posterior border devoid of minute spines.
- Dorsal fin** In salmons, a single fin composed of rays situated dorsally on body approximately halfway between head and tail (Fig. 1, No. 4).
- Dorsal ridge** Apex or dorsal junction of left and right sides of body; dorsal and adipose fins are situated on this ridge (Fig. 1, No. 3-6).
- Dorsal stripe** A band on dorsal ridge which is lighter or darker than adjacent areas.
- Falcate** Curved like a sickle; a fin is falcate when its distal edge is concave, having middle rays shorter than anterior and usually posterior rays.
- Filaments** See *gill filaments*.
- Fork length** Distance in a straight line from anteriormost part of tip of upper jaw or snout of juvenile salmons to apex of angle produced by two lobes of caudal fin (Fig. 1, No. 1).
- Gill arch** Branchial skeleton which contains gill rakers and gill filaments, or lamellae (Fig. 2).
- Gill cover, opercle, or operculum** Large, very flat, thin bones on each side of head which cover gills (see Fig. 3, which has the major portion of the gill cover removed).
- Gill filaments (lamellae)** Pleated folds of skin, richly supplied with blood vessels, attached to posterior edge of gill arch (Fig. 2, No. 5).
- Gill rakers** Projections on anterior edge of first gill arch (Fig. 2, No. 1).
- Head length** Distance in a straight line from anteriormost part of upper jaw or snout to posterior margin of opercle (Fig. 1, No. 2).
- Hypural** Complex of expanded and fused bones of last few vertebrae which support caudal fins in certain fishes.
- Jack** Precocious male salmon which spawn after spending a year or two less in the ocean than the majority of individuals; they are notably smaller than average size of spawning males of their species.
- Juvenile** As used here, a salmon between 25 and 110 mm FL which has not entered smolt stage.
- Lamellae** See *gill filaments*.
- Lateral line** A line formed by a series of sensory tubes and pores extending along sides from head to tail (Fig. 1, No. 10).
- Lateral line scale count** A count of pored scales from first scale on body behind head posteriorly to above hypural.
- Melanophores** Chromatophores with dark or black pigment.
- Parr marks** Squarish or oblong blotches or pigmented areas along sides of presmolt salmonids (Fig. 1, No. 9).
- Pectoral fins** Anterior or uppermost of paired fins of fishes, one on each side of breast immediately behind head (Fig. 1, No. 13).
- Pelvic fins** A ventral pair of fins, abdominal in salmonids (Fig. 1, No. 15).
- Postdorsal ridge** That portion of dorsal ridge behind dorsal fin (Fig. 1, No. 5).
- Predorsal ridge** That portion of dorsal ridge before dorsal fin (Fig. 1, No. 3).
- Presmolt** A juvenile salmon with parr marks; in pink salmon, which lack parr marks, demarcation between a presmolt and smolt is slight, differing chiefly in latter's more adult shape.
- Pupil of eye** Opening in iris of eye by which light reaches retina. It is circular in fishes (Fig. 1, No. 7).
- Pyloric caeca** Fingerlike diverticula, usually glandular, which open into alimentary canal

of most fishes at junction of stomach and intestine in region of pylorus (Fig. 7, No. 3).

Rakers See *gill rakers*.

Redd Excavation or nest made by a spawning salmon.

Rudimentary Very small and poorly formed, pertaining here chiefly to smallest gill rakers and anal rays (Fig. 5, "0").

Slab-sided When depth of body, measured before dorsal fin, is considerably greater than width of body.

Smolt As used here, a young salmon which has lost its parr marks. Pink and chum salmon fry usually go to the ocean within a few days of emerging from the streambed and usually do not undergo a visible change in morphology or color in fresh water.

Subadult An individual similar to an adult and approaching adulthood in age and size but still incapable of breeding.

Terete Nearly cylindrical in cross section and tapering toward the front and rear.

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Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

By

ROBERT J. McCONNELL and GEORGE R. SNYDER

National Marine Fisheries Service
Northwest Fisheries Center
2725 Montlake Boulevard East
Seattle, Washington 98102

ABSTRACT

A key is presented with descriptive illustrations to help in field identification of live, juvenile salmonids in fresh waters of the Pacific Northwest. Other juvenile fish that may be mistakenly identified as salmonids are included.

INTRODUCTION

Species identification of live, anadromous juvenile salmonids is frequently a problem to the field biologist. The purpose of this key is to list and illustrate the external characteristics which will expedite field identification of juvenile salmonids in the Pacific Northwest.

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish¹ that may be mistaken for salmon or trout in fresh water are described in this key.

USE OF KEY

The characteristics for identification are listed in a series of alternative statements, some of which are illustrated. To use the key, examine the first statement; if applicable, proceed to the next and continue to successive statements until the species is identified. If a statement is not applicable, pass to the alter-

native characteristics indicated by numbers in parentheses (numbers on the drawings correspond to numbers of statements in the key). Continue in this manner until the specimen is identified. Some external characteristics are positive separating features (marked with asterisk), whereas others are not. Therefore, two or more statements should be considered before final rejection. If a precise identification cannot be made using the external characteristics—and the fish can be sacrificed, a positive identification can usually be made from internal features (marked with double asterisks). A bibliography of keys that utilize more descriptive internal characteristics is included in this paper.

KEY

1. (47) Adipose fin and scales present.
(Fig. 1)
2. (48) Fleshy appendage at base of pelvic fins present.
3. (49) Mouth large, reaching at least to center of eye.

Family Salmonidae

¹ Especially adult smelt, family Osmeridae.

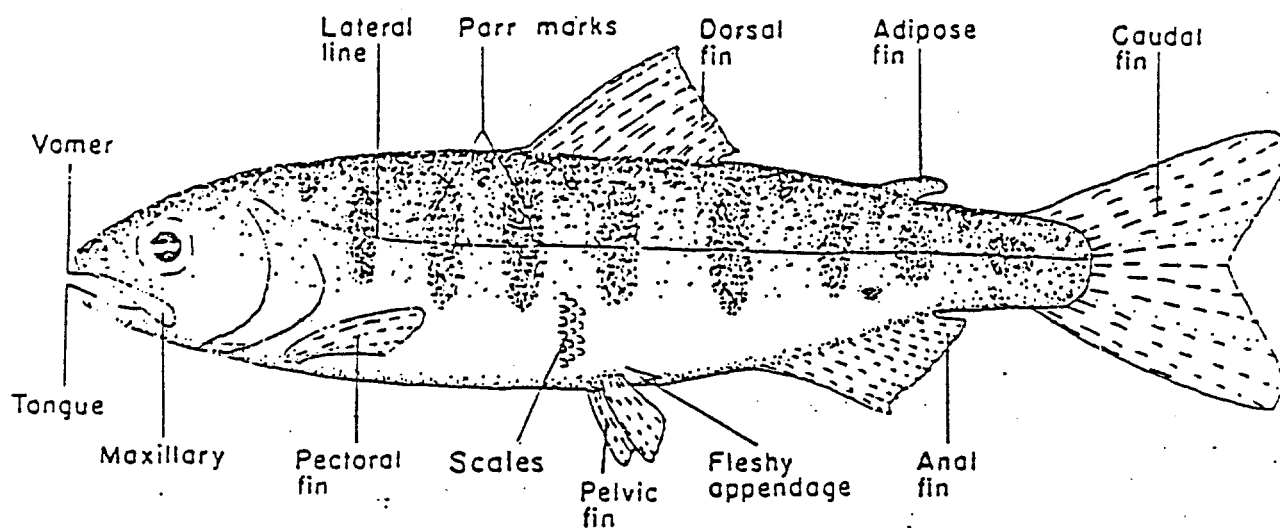


Figure 1.—A hypothetical salmonid showing external characteristics.

4. (17) Anal fin higher than long, with 8 to 12 developed rays (Fig. 2A).
5. (52) *Teeth on head and shaft of vomer. (Fig. 3A)

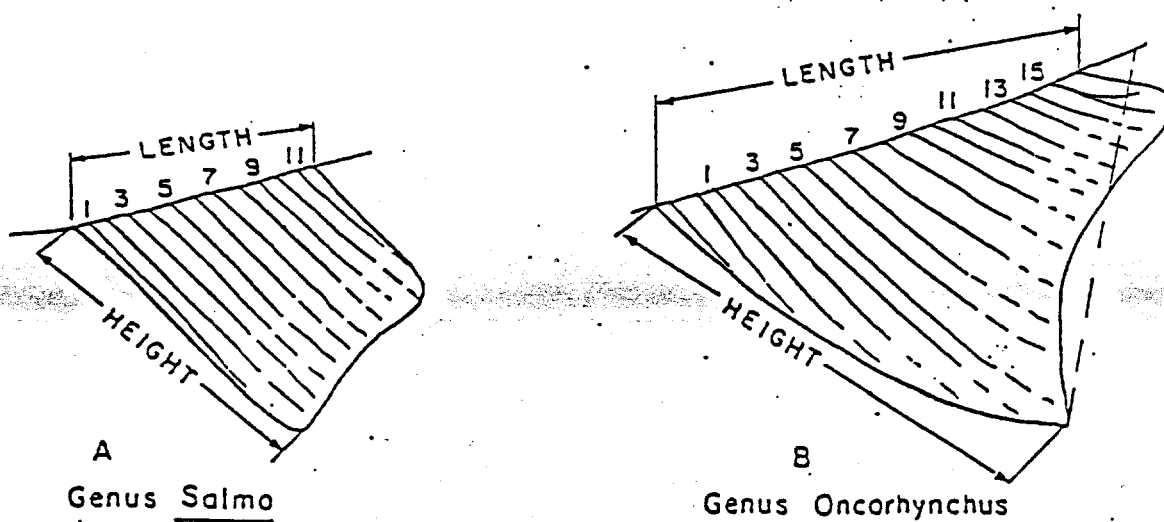


Figure 2.—Anal fins: (A) Trout, genus *Salmo*; (B) Pacific salmon, genus *Oncorhynchus*. The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior lobe. In counting fin rays, include only those which originate from the base and terminate at the outer margin of the fin or are half as long as [or greater than] the longest ray.)

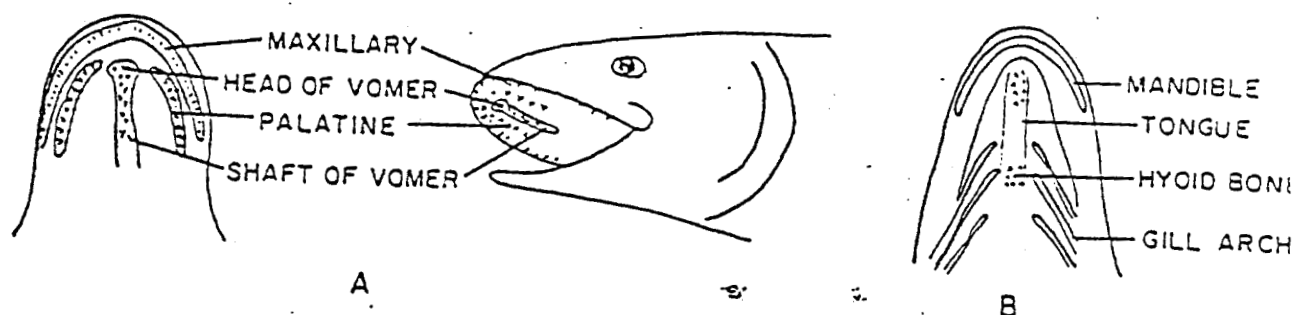
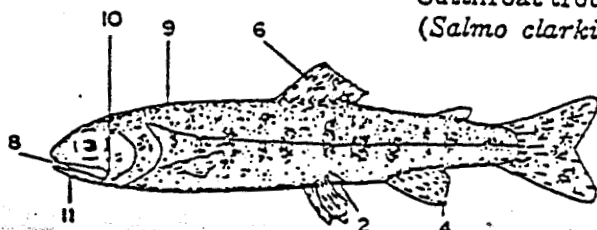


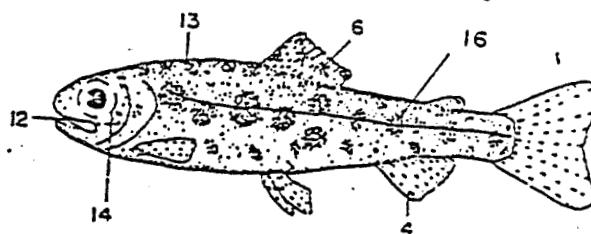
Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches of the lower jaw and are difficult to find.)

6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

7. (53) Adipose fin not orange; no row of pale round spots along lateral line.
8. (12) *Small hyoid teeth at base of tongue. (Fig. 3B)
9. (13) Not more than five parr marks on mid-dorsal ahead of dorsal fin.
10. (14) Maxillary reaching past posterior margin of eye.
11. (15) Red or yellowish hyoid mark under lower jaw. Tail usually black spotted.
Cutthroat trout
(*Salmo clarki*)

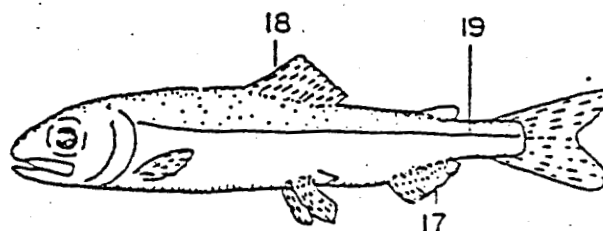


16. (20) Parr marks almost round.
Rainbow or steelhead trout
(*Salmo gairdneri*)



17. (4) Anal fin longer than high, with 13 or more developed rays. (Fig. 2B)
18. (6) Dorsal fin without large dark spots, may be black tipped.
Pacific salmon
Genus *Oncorhynchus*

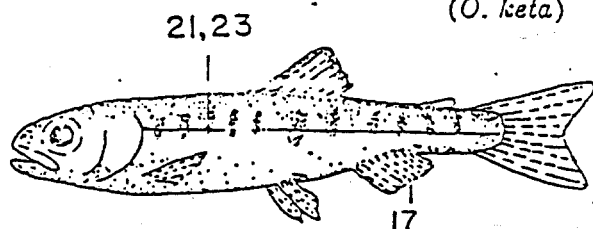
19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.
Pink salmon
(*O. gorbuscha*)



12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

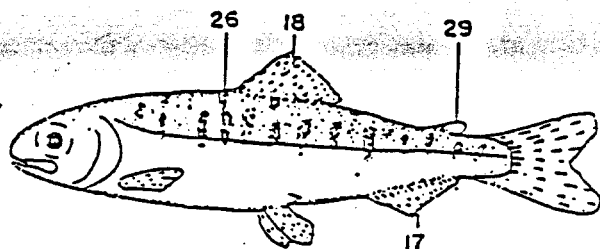
- 20. (16) Parr marks present as vertical bars or oval spots.
- 21. (30) Parr marks short, extending little, if any, below lateral line.
- 22. (25) Gill rakers on first arch, 19 to 26.
** Pyloric caeca, 140 to 186.
- 23. (26) Parr marks faint. Sides below lateral line iridescent green.
- 24. (27) Small when migrating from fresh water, approximately 1.5 inches (40 mm) long.

Chum salmon
(*O. keta*)



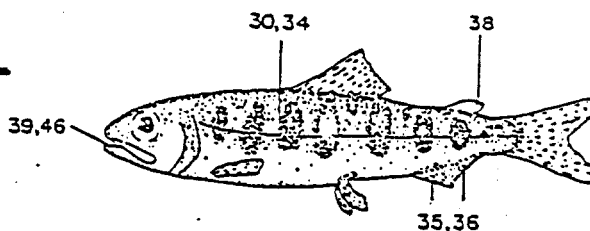
- 25. (22) Gill rakers on first arch, 30 to 40.
**Pyloric caeca 60 to 115.
- 26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
- 27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
- 28. (31) Gill rakers long and slender, more than 29 on first arch.
- 29. (32) Adipose fin clear, not pigmented.

Sockeye salmon
(*O. nerka*)



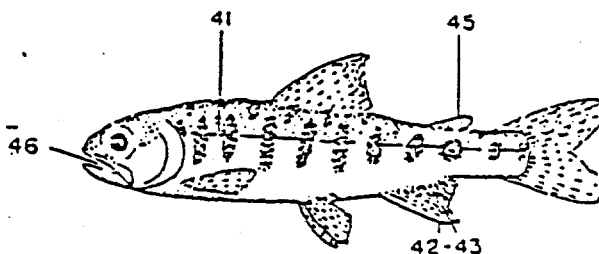
- 30. (21) Parr marks large, vertical bars centered by lateral line.
- 31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
- 32. (29) Adipose fin at least partially pigmented.
- 33. (40) **Pyloric caeca more than 90.
- 34. (41) Parr marks broader than interspaces.
- 35. (42) Anterior rays of anal fin not distinctly longer than rest, not white edged.
- 36. (43) Anal fin not pigmented.
- 37. (44) Black spots, when present, on both lobes of caudal fin.
- 38. (45) Adipose fin not completely mottled, clear area at anterior base of fin.
- 39. (46) Black gums along base of lower teeth.

Chinook salmon
(*O. tshawytscha*)



- 40. (33) **Pyloric caeca less than 80.
- 41. (34) Parr marks narrower than interspaces.
- 42. (35) Anterior rays of anal fin elongated; when depressed they extend to base of last ray. (Fig. 2B)
- 43. (36) Anal fin pigmented between rays, resulting in black banding.
- 44. (37) Black spots, when present, on upper lobe of caudal.
- 45. (38) Adipose fin completely pigmented.
- 46. (36) Mouth gray to white.

Coho salmon
(*O. kisutch*)



47. (1) Adipose fin not present; scales present or lacking.
Not Salmonidae
48. (2) No fleshy appendage at base of pelvic fins.
Smelts
Family Osmeridae
49. (3) Mouth small, not reaching center of eye; teeth weak or absent.
50. (51) Depressed dorsal fin, shorter than head.
Whitefishes
Genus *Coregonus*
51. (50) Depressed dorsal fin, longer than head.
Arctic grayling
(*Thymallus arcticus*)
52. (5) **Teeth on head of vomer only.
Chars
Genus *Salvelinus*
Dolly Varden (*S. malma*)
53. (7) Adipose fin orange; row of distinct pale round spots along lateral line.
Brown trout
(*Salmo trutta*)

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